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THESIS

AUTOMATICALLY GENERATING A DISTRIBUTED 3D BATTLESPACE USING USMTF AND XML-MTF AIR TASKING ORDER, EXTENSIBLE MARKUP LANGUAGE (XML) AND VIRTUAL REALITY MODELING LANGUAGE (VRML)

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For the past three decades, the Department of Defense (DoD) has used the U.S. Message Text Format (USMTF) as the primary means to exchange information and to achieve interoperability between joint and coalition forces. To more effectively exchange and share data, the Defense Information Systems Agency (DISA), the lead agency for the USMTF, is actively engaged in extending the USMTF standard with a new data sharing technology called Extensible Markup Language (XML). This work translates and synthesizes Air Tasking Order (ATO) data messages written in XML into a three-dimensional (3D) air attack plan within a virtual environment through the use of the Virtual Reality Modeling Language (VRML).

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ABSTRACT

For the past three decades, the Department of Defense (DoD) has used the U.S. Message Text Format (USMTF) as the primary means to exchange information and to achieve interoperability between joint and coalition forces. To more effectively exchange and share data, the Defense Information Systems Agency (DISA), the lead agency for the USMTF, is actively engaged in extending the USMTF standard with a new data sharing technology called Extensible Markup Language (XML). This work translates and synthesizes Air Tasking Order (ATO) data messages written in XML into a three-dimensional (3D) air attack plan within a virtual environment through the use of the Virtual Reality Modeling Language (VRML).

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EXECUTIVE SUMMARY

The U.S. Message Text Format (USMTF) has served as the vehicle for interoperability for the Department of Defense's (DOD's) messaging system. While the USMTF program has been successful since the 1970's, its useful life is coming to end due to the development of the Extensible Markup Language (XML). The Extensible Markup Language has the potential to enable data and systems interoperability for DOD and revolutionize the way data is structured, processed, and displayed.

Unlike USMTF, which can only send the text of a message, XML allows users to create messages that contain metadata. Metadata is data that describes information. The utilization of metadata is powerful because it provides the consumers of information the ability to transform, organize, and render data in ways that suits their needs.

Realizing XML's power and advantages, the Defense Information Systems Agency, along with other DOD organizations, is looking to XML as a replacement for USMTF. In this regard, DISA has sponsored a new group, the XML-MTF Development Team, to develop a specification and software tools that transform messages between the USMTF and the XML-MTF standards.

At same time XML was evolving, a new computer animation language, called Virtual Reality Modeling Language (VRML), was being developed. The Virtual Reality Modeling Language (VRML) is a non-proprietary, international standard for describing virtual objects and worlds over networks. VRML is capable of representing three-

dimensional (3D) animated objects and multimedia objects with hyperlinks to other media such as text, sounds, movies, and images.

This thesis leverages off the work of the XML-MTF Development Team and the Virtual Reality Modeling Language. The goal is to synthesize an air plan from a series of XML documents and render it in a three-dimensional world. To achieve this goal, an XML ATO, based on the XML-MTF Air Tasking Order DTD, was created.

To convert an XML ATO into a VRML world, the XML ATO is put through a series of transformations. These transformations create new modularized XML documents, the most important of which are partial unit flight plans. Partial unit flight plans are made into final unit flight plans by adding a unit's detailed flight missions. Each unit's final plans, along with threat data, are combined into a single XML document called the Master Operation Document (MOD). The final step is translating the MOD into VRML source code capable of animating an ATO in a virtual world.

The VRML code produced is modular. The code calls upon a group of VRML objects that are filed away like a stack of library books. These objects are called PROTOs, which is short for prototype. The PROTOs supply the interface between the ATO VRML code and a detailed set VRML code that describes virtual models and behaviors such as flying aircraft. The PROTOS offer code modularity that permits the ATO VRML code to reference complex virtual objects by name. This allows the ATO VRML code to remain simple thus straightforward to auto-generate and maintain.

The end result is an intricate three-dimensional (3D) world populated with aircraft, terrain, and target models. The virtual world permits the viewer to navigate from

a high point that gives a map view of the ATO all the way down to flying behind an aircraft to see how it interacts with the terrain, targets, and other aircraft. The virtual world is the culmination of the power of XML to provide structured, well-formed data that can be transformed to any visual format.

I. INTRODUCTION

A. OVERVIEW

The U.S. Message Text Format (USMTF) has served as a vehicle for joint warfighting interoperability since the 1970's. While the USMTF program has been successful since its inception, its useful life is coming to end due to the development of the Extensible Markup Language (XML). The Extensible Markup Language has the potential to enable data and systems interoperability for DOD and revolutionize the way data is structured, processed, and displayed.

Unlike USMTF, which can only send the text of a message, XML allows users to create messages that contain metadata. Metadata is data that describes information. The utilization of metadata is powerful because it provides the consumers of information the ability to transform, organize, and render data in a way that suits their needs.

This thesis seeks to translate and synthesize USMTF-based Air Tasking Order (ATO) data messages written in XML into a three-dimensional (3D) air attack plan within a virtual battlespace. Key to creating a realistic and robust virtual environment is the Virtual Reality Modeling Language (VRML). VRML is a non-proprietary, international standard for describing virtual objects and worlds over networks. VRML is capable of representing three-dimensional (3D) animated objects and multimedia objects with hyperlinks to other media such as text, sounds, movies, and images.

The end result of combining the powers of both XML and VRML is an intricate three-dimensional (3D) world populated with aircraft, terrain, and target models. The

virtual world permits the viewer to navigate through an ATO in both space and time and to observe interactions between aircraft, terrain, and targets.

B. OBJECTIVES

The objective of this thesis is to demonstrate the viability of using XML and VRML to transform and render the actions specified by an Air Tasking Order (ATO) and unit flight plans within a virtual battlespace. To develop a 3D virtual air plan from an ATO, the following critical structures must be developed:

- XML-encoded operational documents that describe an air plan and an ATO.
- An interface that will transform relevant ATO data from XML into appropriate VRML objects.
- Virtual battlespace environment design in VRML
- VRML PROTO libraries that are referenced by the code auto-generated from XML Master Operational Document (MOD)

C. THESIS ORGANIZATION

Chapter II reviews background information on the Extensible Markup Language (XML), U.S. Message Text Format (USMTF), government sponsored XML message initiatives, the Virtual Reality Modeling Language (VRML), and the air tasking process. Chapter III provides a description of the XML/VRML opportunity and a synopsis of implementation strategy and its relevant technical components. Chapter IV introduces a tactical scenario upon which the virtual air plan is based. Chapter V presents the XML data structures that are employed to create a rich virtual air plan. Chapter VI uncovers the steps required to transform an ATO into a virtual air plan. Chapter VII identifies the

fundamental VRML elements that make up the content of a virtual battlespace. Chapter VIII presents the results of the virtual air plan demonstration and describes limitations of the model and the transformation and rendering processes. Chapter IX summarizes the conclusions and recommendations for future work of this thesis.

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II. BACKGROUND AND RELATED WORK

A. INTRODUCTION

This chapter reviews the fundamental concepts that are the basis for understanding the development and generation of animated 3D air plans. Topics examined in this chapter include the Extensible Markup Language (XML), US Message Text Format (USMTF), and the Virtual Reality Modeling Language (VRML).

B. THE EXTENSIBLE MARKUP LANGUAGE (XML)

1. Overview

The explosion of the World Wide Web during the 1990's can be directly attributed to the creation and implementation of the Hypertext Markup Language (HTML). The Hypertext Markup Language is a subset of a more extensive language called the Standard Generalized Markup Language (SGML). HTML has enjoyed overwhelming success due to its simplicity. The Hypertext Markup Language's simplicity lies in its use of markup tads (character elements bracketed by '<' and '>') that are predefined by a standardized Document Type Definition (DTD). Essentially, HTML elements identify how web browsers display information, text, and pictures. A simple example, shown in Figure 2.1, displays mission data that is typically part of an Air Tasking Order.

```
<html>

<head>

<title>HTML Example of ATO Data</title>

</head>

<body>


<p>Mission Number: 100 </p>
<p>Number of Aircraft: 1 </p>
<p>Type of Aircraft: F16 </p>
<p>Aircraft Call Sign: Eagle1 </p>


</body>

</html>
```

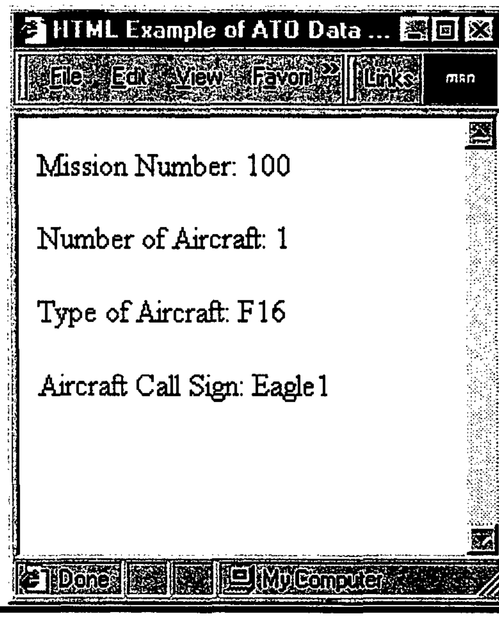

Figure 2.1. HTML Example

While HTML's standardized DTD enables simplicity, it does not readily allow for the insertion of metadata (data describing data) within a web page. For example, programmers are unable to change the name of the paragraph elements, "<p></p>", associated with mission number 100 to "<mission_number></ mission_number>". In essence, HTML is not extensible. This lack of extensibility leads to unstructured data within HTML web pages. Consequently, it is difficult to access and manipulate data written in HTML.

The Hypertext Markup Language's inability to incorporate metadata into information might have been solved by the implementation of the Standard Generalized Markup Language (SGML). SGML permits users to define their own tagsets via a Document Type Definition (DTD), thereby allowing users to insert metadata through the creation of their own element types. However, SGML's element type advantages are

outweighed by its hard-to-understand and cumbersome specification, which totals over 500 pages. (Khare, 1999, pg. 81) In an effort to combine the simplicity of HTML and the information exchange advantage of SGML, the World Wide Web Consortium (W3C) designed a new language called Extensible Markup Language (XML). The Extensible Markup Language is being developed as the 80/20 solution, meaning that XML will provide 80% of SGML's functionality at a cost of 20% of SGML's complexity.

Like SGML, XML allows users to define their own tagsets (element types) and therefore their own metadata. In essence, data becomes self-describing. To achieve these results, programmers need, at a bare minimum, to develop XML documents that are well-formed. In order to create well-formed XML documents, common basic syntax rules for tags must be obeyed.

To produce a higher-level XML document, programmers need to ensure the document is valid. Validity is obtained by attaching a Document Type Definition (DTD) to an XML Document. Simply attaching a DTD to an XML does not achieve validity; programmers must also abide by the strict data-relationship rules specified within the DTD and the same syntax rules that create a well-formed document. Interestingly, valid XML documents are well-formed, but well-formed documents are not necessarily valid. (Harold, 2000, slide 93)

Both valid and well-formed XML documents create data trees. (Harold, 2000, pg. 435) This is essential because XML data-transformation tools, known as parsers, can easily transform a XML document's data trees into entirely different data trees. Parsers can also combine several data trees/XML documents into a single XML document.

Programmers can customize such data transformations by creating a style sheet with Extensible Stylesheet Language (XSL), attaching the style sheet to the XML document, and then processing the XML document with a parser. XSL is not limited to data transformations; it can also be used to display data in a format friendly to users needs.

Besides specifying information formats, programmers will have the choice to provide users with multi-directional data links through the use of XLink. XLink creates and describes a multi-directional link between an XML document and another data resource. Multi-directional links give users the power to specify what data they want to retrieve into their XML document.

XML and its subcomponent technology, XSL, provide the fundamental mechanisms to quickly and easily share data over the Internet. The XML 1.0 specification is well-developed and is recommended by the World Wide Web Consortium (W3C). Many commercial companies have integrated the specification into their products. However, some XML components (e.g., XLink) are still not fully specified and implemented. Assuming software companies developing XML capable tools and browsers properly implement the XML specification, XML will provide a complete environment of interoperability for data exchange.

2. XML Technological Components

a. XML Elements and Attributes

Documents created using XML have two fundamental nodes – elements and attributes. Elements are the holders of data. Element names are typically named to indicate metadata, i.e., information about the data. A simple example is an element holding the mission number.

```
<mission_number> 100 </mission_number>
```

As shown in the example, the data is the number "100" and the metadata contained in the brackets is "mission_number." Elements are not relegated to holding only data; they can be specified to hold other elements. The elements defined inside other elements are called children and their predecessor is called the parent. The parent-child relationship in an XML document is how a data tree is formed. Below is an example of a DTD that depicts a data tree and two simple parent-child relationships, SQUADRON and TAKEOFF_POSITION.

```
<!-- Document Type Definitions (DTD) for Squadron -->

  <!ELEMENT SQUADRON (SQUADRON_NAME, PLANE*)>
   <!ELEMENT SQUADRON_NAME (#PCDATA)>
   <!ELEMENT PLANE (TAIL_NUMBER, PLANE_TYPE, CALLSIGN, TAKEOFF_POSITION)>
      <!ELEMENT TAIL_NUMBER (#PCDATA)>
      <!ELEMENT PLANE_TYPE (#PCDATA)>
      <!ELEMENT CALLSIGN (#PCDATA)>
      <!ELEMENT TAKEOFF_POSITION (LATITUDE, LONGITUDE)>
          <!ELEMENT LATITUDE (#PCDATA)>
          <!ELEMENT LONGITUDE (#PCDATA)>
```

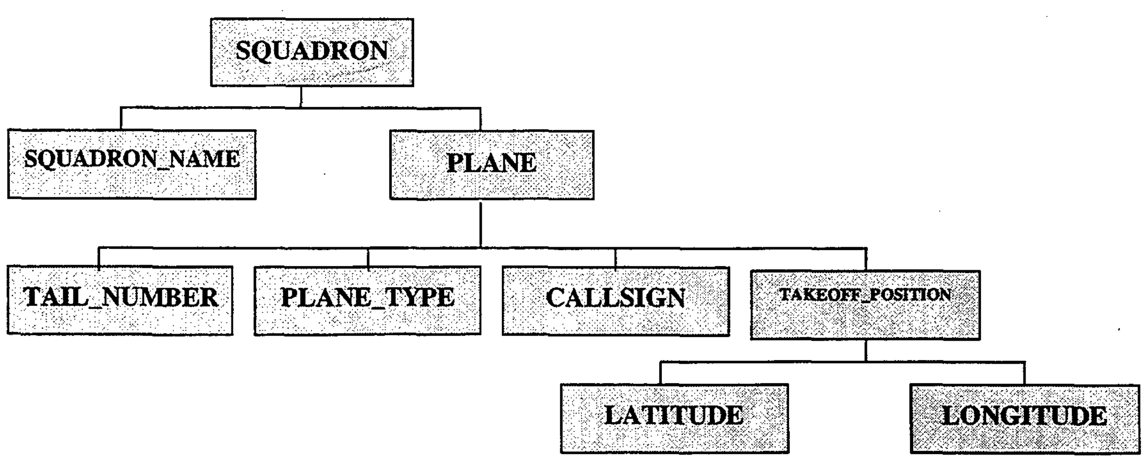

Figure 2.2. DTD Data Tree and Simple Parent-Child Relationships

Attributes are used to further describe elements and are typically used in two circumstances. First, they can be used for information non-relevant to data consumers. A simple example is using the "ID" attribute for element, which provides the element with a unique name. Another example would be attaching an attribute to an element that contains an email address. Assuming data consumers do not care about the type of email service, an attribute might be used to contain the type of email server associated with the email address, thus providing better support by an associated infrastructure. This is shown in Figure 2.3.

```
DTD Representation

<!ELEMENT EMAIL_ADDRESS (#PCDATA)>
  <!ATTLIST EMAIL_ADDRESS  email_server_type  CDATA  #IMPLIED>
-------------------------------------------------------------------

XML Data Representation

<EMAIL_ADDRESS email_server_type='POP3'>johndoe@navy.nps.mil</EMAIL_ADDRESS>
```

Figure 2.3. Example of an Attribute

The second way to use attributes is to substitute them in place of further child elements for information deemed integral to the element. Attributes are good alternatives for child elements because their contents can be defined in greater detail than an element's contents. DTD designers typically want to substitute attributes for child elements when the child elements are "leaves" of a data tree. Data leaves are those elements that have no children. The chief reason why attributes are only used at the leaf level is that they cannot hold a structure well. (Harold, 2000, pg. 101) Attributes essentially truncate branches of an XML data tree and provide tight groupings of information in lieu of creating additional child elements.

Referring back to the Squadron DTD example above, the design might have placed all of the "PLANE" data in a series of attributes. As shown in Figure 2.4, all of the "PLANE" information specified in the attributes is at the same data-structure level. As a result, the "TAKEOFF_POSITION" element structure cannot be supported within the attribute. Additionally, the use of generic names for the latitude and longitude positional data is unsupportable because without specifically identifying new tags such as LATITUDE_OF_TAKEOFF and LONGITUDE_OF _TAKEOFF, it is not possible to tell what type of latitude and longitude data is being relayed. The values might be a flight position, a takeoff position, or a landing position. Thus use of attributes can provide a more concise, precise, and adaptable tagset.

```
<!-- Example of a DTD for PLANE using attributes -->

<!ELEMENT PLANE EMPTY>
  <!ATTLIST PLANE
      TAIL_NUMBER             CDATA    #REQUIRED
      PLANE_TYPE              CDATA    #REQUIRED
      CALLSIGN                CDATA    #REQUIRED
      LATITUDE_OF_TAKEOFF     CDATA    #REQUIRED
      LONGITUDE_OF_TAKEOFF    CDATA    #REQUIRED>
```

Figure 2.4. Attributes and Data Structure

b. Document Type Definition (DTD)

A Document Type Definition (DTD) is a list of tags that defines specific elements and attributes. DTDs also describe the relationships and format between elements and attributes. (Harold, 2000, slide 95) DTDs ensure the validity of an XML document by requiring the data in the XML document to adhere to the prescribed format and structure.

DTDs are enablers of interoperability because they can serve as the information exchange standard for unrelated organizations using XML applications.

c. Extensible Style Language (XSL)

The Extensible Style Language (XSL) is a stylesheet language within the XML specification. XSL is composed of a transformation language and a formatting language. The XSL transform language allows XML data trees to be converted into a different data tree. The transformation language can also synthesize several XML data trees into a single data tree.

The XSL formatting language is designed to display data contained in XML documents. The formatting language emphasizes the rendering of data into a manner that suits users' needs. In this manner, programmers can provide formatting instructions to convert data for any application or system. For example, a single USMTF message might be automatically and appropriately formatted via different XSL stylesheets for email, a web page, printing, palmtop display, compressed storage, etc.

d. XLink

XLink is an experimental XML technology that allows programmers to embed hyperlinks in XML data. An Xlink creates and describes a link between an XML document and another data resource, typically another XML document. XLink is similar to HTML hypertext links but more powerful. XLink will provide unidirectional links like HTML hypertext links, but will also go beyond this by supporting multi-directional links. Multi-directional links will allow users to retrieve data into their XML document from sources such as databases and other XML documents.

C. UNITED STATES MESSAGE TEXT FORMAT (USMTF)

1. Overview of the USMTF Program

The United States Message Text Format (USMTF) is a well-documented government-proprietary messaging standard used for sharing structured information. The Defense Information Systems Agency (DISA) is the sponsor of the USMTF program and maintains the configuration management of the USMTF standard for the Department of Defense (DOD). The Defense Information Systems Agency (DISA) and the DOD designed the USMTF standard to serve the purpose of enhancing "...joint and coalition warfighting effectiveness through the standardization of message formats, data elements, and information exchange procedures." (Chairman Joint Chiefs of Staff Instruction 6241.01, 1996, pg. 1)

The essence of USMTF is to create an environment of information exchange, which allows joint forces and systems to achieve interoperability. To achieve this vision, DOD has established objectives for the USMTF program. They are shown in Figure 2.5.

1. "Produce standardized, single-syntax character-oriented message formats for all DOD information requirements. These formats facilitate the transfer of information, while maintaining system independence."

2. "Reduce the time and effort required to draft, transmit, analyze, interpret, and process messages."

3. "Improve information exchange through vocabulary and syntax control and standardization of data elements."

4. "Standardize information exchange procedures."

5. "Provide uniform reporting procedures to be used in the daily exchange of information."

6. "Facilitate exchange of information between the United States, allied commands, and other friendly nations. Reduce or eliminate dual reporting by US units when they operate with allied commands and other friendly nations."

7. "Provide human readability where required."

Figure 2.5. USMTF Objectives
(Chairman Joint Chiefs of Staff Instruction 6241.02, 1996, pg. 2-3.)

2. The Extensible Markup Language – Message Text Format (XML-MTF) Initiative

The U.S. Message Text Format (USMTF) has been highly successful over the past three decades because it has enjoyed full buy-in from all DOD Services, Agencies, Commander-In-Chiefs (CINC), and allies. With this strong backing, USMTF is able to support the full spectrum of military operations. Despite USMTF's long standing as the information exchange workhorse for DOD, USMTF is nearing the end of its useful life due to several limitations.

First, USMTF was originally developed in the 1970's; consequently, the DOD is burdened by a 30-year-old acquisition strategy when maintaining USMTF. This forces the government to own and maintain the USMTF standard (Military Standard 6040). As a result, no Commercial-Off-The-Shelf (COTS) products are available to easily upgrade USMTF. In addition, when upgrades to the USMTF are necessary, the DOD must contract the work out at a higher-than-normal rate because the civilian workforce is subjected to a learning curve due to the workforce's general unfamiliarity with the governmental standards of USMTF. (Hall, 1999, slide 6)

The presentation style of USMTF is also a limiting factor. In the 1970's, the DOD was reliant on the use of the Teletype; therefore, the presentation format for USMTF is restricted only to Teletype display characters, capital letters and numbers. (Hall, 1999, slide 6) Compared to today's web-based display of text and multimedia, USMTF's presentation format is archaic and neither reader friendly nor reader specified.

Lastly and most importantly, the USMTF is only able to send the message itself. Under current USMTF methods and technologies, no metadata can be transmitted within the message. The utilization of metadata (information that describes data) is powerful because it provides the consumers of information with the ability to personally organize, search, filter, and render data.

Fortunately, private industry would like to solve the problem of computer-to-computer information exchange over the World Wide Web and are developing XML as the answer. As the caretaker of USMTF, the Defense Information Systems Agency (DISA) is actively looking to an XML encoding as the replacement for USMTF in an effort called the Extensible Markup Language – Message Text Format (XML-MTF). An appropriately

designed XML tagset can fulfill the fundamental USMTF requirements for platform independent exchange of information and much more.

The chief advantage of XML is that users can structure their data uniquely, gain reliable interoperability, and include metadata through the use of DTDs. This allows producers and consumers of information to more easily exchange data between applications. This capability is an important factor for DOD because many systems suffer from interoperability issues. With the use of XML, complex systems will no longer need to develop costly data translators or sub-systems to utilize and exchange information. Instead, low-cost, low-complexity XSL stylesheets can be used to parse and transform data to whatever formats are necessary.

Since XML is a commercial standard, USMTF will no longer be tied to a proprietary government standard. The Department of Defense will have the ability to buy COTS XML tools and products that can be used to update and maintain USMTF systems. Additionally, there will be a knowledgeable contract civilian workforce available to quickly develop system updates.

To provide DOD with the proper XML-MTF effort, the Extensible Markup Language – Message Text Format (XML-MTF) Development Team was formed in May 1999. The team was charged with developing an XML-MTF specification and software tools that transform messages between the USMTF and the XML-MTF standards. (Hopkins, Brian, 2000, pg. 1).

At the heart of the XML-MTF Development Team's efforts is the *XML-MTF Mapping* document. The purpose of the document is to define the rules for XML-MTF message documents and their relationship to USMTF messages. To aid this development, the XML-MTF Development Team established the following "Design Principles:"

1. **"XML-MTF shall be easy to read, use, and understand. Descriptive names and logical structures that resemble as much as possible the structure of MTF standards shall be favored over terse abbreviations and clever shortcuts.**

2. **XML-MTF shall be designed to ensure widespread military adoption. In keeping with this principle, XML-MTF shall be designed to accommodate current MTF standards.**

3. **XML-MTF documents should be easy to construct from basic rules mapping it to MTF formats. Transformation of XML-MTF to formats such as USMTF, AdatP-3, and OTH-T Gold should be as simple as possible.**

4. **XML-MTF schemas should be easy to construct; drawing from the logical structure of MTF message standard databases, such as those defined for USMTF and ADatP-3.**

5. **Operations on XML-MTF documents, such as a query, should be resilient to schema changes.**

6. **XML-MTF shall use XML elements for message data, and XML attributes for specifying value-added annotations (e.g., classification, pedigree).**

7. **XML-MTF shall as much as possible draw on industry adopted standards and technologies to save time and money."**

Figure 2.6. XML-MTF Development Team Design Principles
(XML Development Team, 2000, pg. 1)

While XML offers a tremendous opportunity for DOD information exchange, XML-MTF is not without challenges. Like USMTF, DOD will have to establish a set of XML information exchange protocols. This is not an easy task because DOD encompasses so many different types of information systems and information producers/consumers. In

order to avoid creating a new set of mutually incompatible "stovepipes" and new problems of interoperability, DOD service branches must work together when developing XML data formats. Otherwise, the power of XML will be severely diminished by the stampede of organizations creating incompatible information formats.

D. THE VIRTUAL REALITY MODELING LANGUAGE (VRML)

The Virtual Reality Modeling Language (VRML) is used to develop content for three-dimensional (3D) virtual words. One key feature of VRML is the fact that it is an ISO standard designed to be used over the World Wide Web in a browser environment. The various examples explored in this thesis employ the approved VRML97 version of the standard.

The fundamental design structure in VRML worlds is a scene graph. A 3D scene graph is composed in VRML by grouping and encoding content into nodes. These nodes are used to display objects such as primitive shapes (such as Box and Sphere), elevation grids and complex indexed face sets. The nodes also specify groupings of sub-nodes and can indicate interaction and movement of events throughout the scene graph. The basic steps to design a scene graph are to build a world with visual nodes and then describe the interaction through behavior nodes. VRML provides the standardized interchange language to create these virtual worlds so that they can be viewed with any VRML-capable browser available in open source and as web browser plug-ins.

1. Basic Nodes

VRML has a variety of nodes that can be employed to develop a rich scene graph. The following is a synopsis of key nodes necessary to understand the design of the example battlespace virtual world presented in this thesis.

a. Visual Nodes

The visual aspect of a scene graph is expressed through the Shape node. The Shape node places primitive shapes such as cubes, spheres, and cones into a scene graph by defining a specific shape in the geometry field of the node. These nodes can be grouped, sized, scaled, colored, and textured to build entities of the virtual world.

The Shape node is also used when trying to build more complex objects such as an F-15 aircraft in Figure 2.7. These complex objects can be built using indexed face sets. An IndexedFaceSet Node is an array of polygons used to map out an object in the virtual world. In general, the object is built with the help of a CAD (computer aided design) program or similar authoring tool. The CAD software then converts and exports the object to a VRML compatible IndexedFaceSet Node. The F-15 of Figure 2.7 was built using a CAD program called RcCAD (www.rccad.com) and translated into VRML. The IndexedFaceSet provides a mechanism for creating complicated, realistic shapes in VRML. Once calculated, the object is placed as a value in the geometry field of the shape node and can be manipulated like any primitive shape. Shape Nodes are used to build primitive geometries, which can then be integrated into more sophisticated scene graphs.

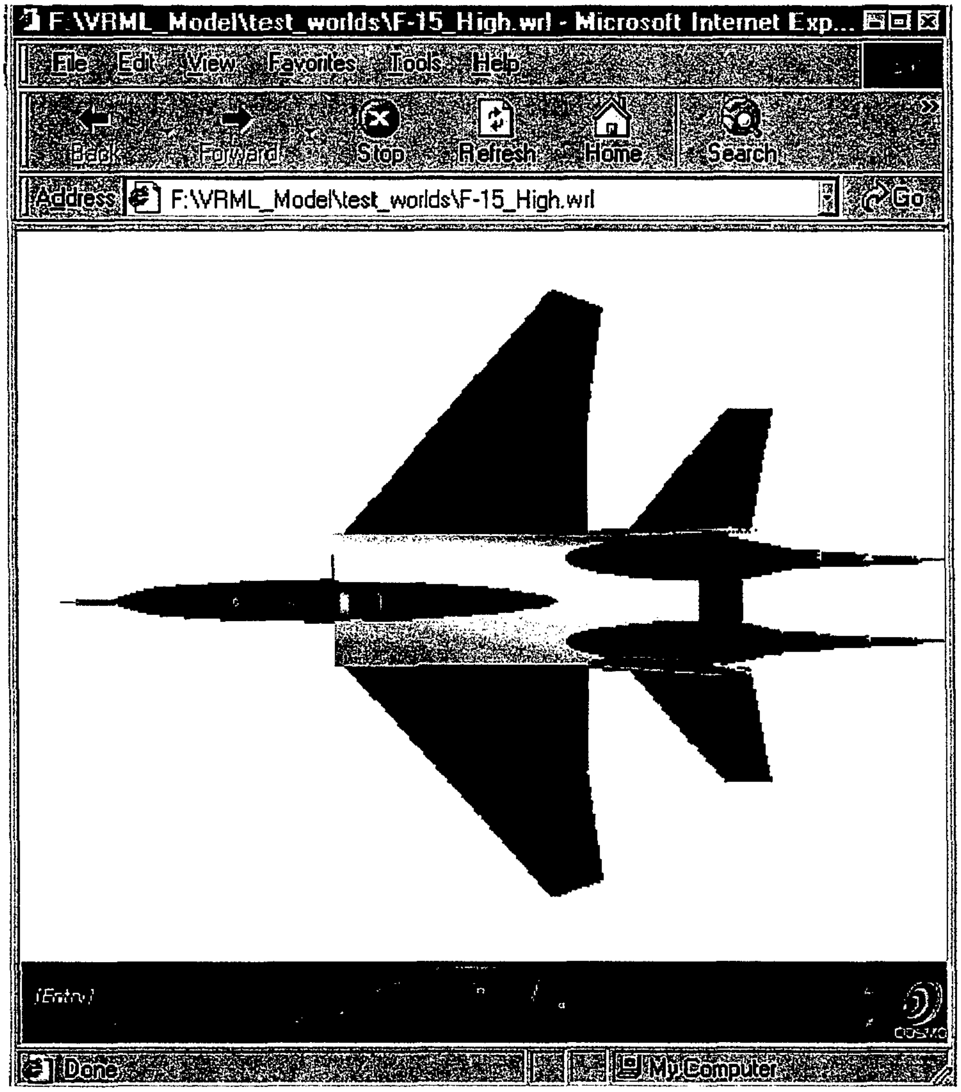

Figure 2.7. F-15 Modeled with RcCAD
After (Pearson, 1999)

The Shape node also contains an Appearance node that presents the author with intricate control over the color of an object. The Appearance node is used in conjunction with the Material and Texture nodes to apply colors and texture images to an object. A terrain map or image could be placed over the elevation data in a virtual world to present a realistic setting. (Brutzman, 1998)

b. *Grouping Nodes*

Grouping nodes cluster sets of nodes for the purpose of creating entities to be manipulated in a scene graph. The most basic of these nodes is the Group node. The Group node simply specifies child nodes that are to be collected together. Slightly more complex, the Transform node is a cornerstone node in VRML. Like the Group node, the transform node clusters child nodes into an entity. The Transform node is also capable of moving the grouped nodes within a local coordinate system. The transform node can specify translational and rotational changes of position to children of the node. This is a fundamental ability of a scene graph. The transform node can be combined with interpolator nodes to create animation in the virtual world. (Brutzman, 1998)

c. *Viewing Nodes*

The Viewpoint node is designed to make navigation of a virtual world easier for the viewer. The Viewpoint node allows a scene graph to include predefined camera angles for suggested viewing. These predefined views of the world are easy to access via the interface bar of the VRML browser and offer practical navigation. Such features are especially convenient and necessary in large worlds. The related NavigationInfo node permits a virtual world to control how a viewer moves about the scene. A viewer may be forced or guided to walk (rather than fly) through a scene. (Brutzman, 1998)

d. *Interpolators and Route Nodes*

Once the geometry and rendering for virtual objects are developed and placed in a scene graph, it is often desirable to animate these objects. To perform such animation, VRML uses interpolators and routes. Interpolators are used to calculate interim states between key values so that the animation transitions smoothly from the start state to

the end state. The most common interpolators are the position and orientation interpolators. These interpolators are used to create translational and rotational animation of objects in the scene graph.

In order for the movement to take place, such calculations must be passed as events into the transformation node of the object. This transfer is done via routes, which pass events. For example a ROUTE can take the calculated changes from an interpolator and redirects the data into the transform node. The modified transform node implements the behavior changes in the scene graph. (Ames, 1997) The prerequisite node that drives the animation process is the Time Sensor node. The Time Sensor provides the clock that the interpolators use to systematically output positional data.

e. Sensor Nodes

There are several types of sensor nodes in the VRML specification, each used to track user interactions and generate events with the virtual world. One fundamental sensor is the Touch sensor. The Touch Sensor activates whenever a mouse cursor or pointing device is placed over (or clicks on) an object. VRML also allows the user to move objects with the mouse via the PlaneSensor, SphereSensor, and CylinderSensor. Sensors provide the primary means for a viewer to interact with a virtual world. (Brutzman, 1998)

f. Script Node

The Script node is used to integrate imperative programming languages such Java and JavaScript (formally know as EcmaScript) into the scene graph. The Script node adds flexibility to develop more sophisticated scene-graph behaviors not inherent in the VRML specification. The Script node is commonly used to perform network access or physics calculations such as those needed by interpolators and sensors.

g. PROTO And EXTERNPROTO Definitions

The PROTO and EXTERNPROTO definitions are used to create new VRML nodes as combinations of other predefined VRML nodes. This becomes useful when developing large, specialized scene graphs. PROTOs can be used to construct complex objects and behaviors that are referenced multiple times or referenced by many

```
#VRML V2.0 utf8
Group {
  children [

        Viewpoint {
               description "initial view"
               position    6 -1 0
               orientation 0  1 0 1.57
}

        Shape {

            geometrySphere{ radius 1 }
            appearance Appearance{
            texture ImageTexture {
                  url "earth-topo.png"}}}

        Transform {
           translation 0 -2 1.25
           rotation     0  1 0   1.57
           children [

            Shape {
             geometry Text {
              string [ " Hello" "world!"
]}           appearance Appearance {
              material Material {
                  diffuseColor 0.1 0.5 1
        } } } ] } ] }
```

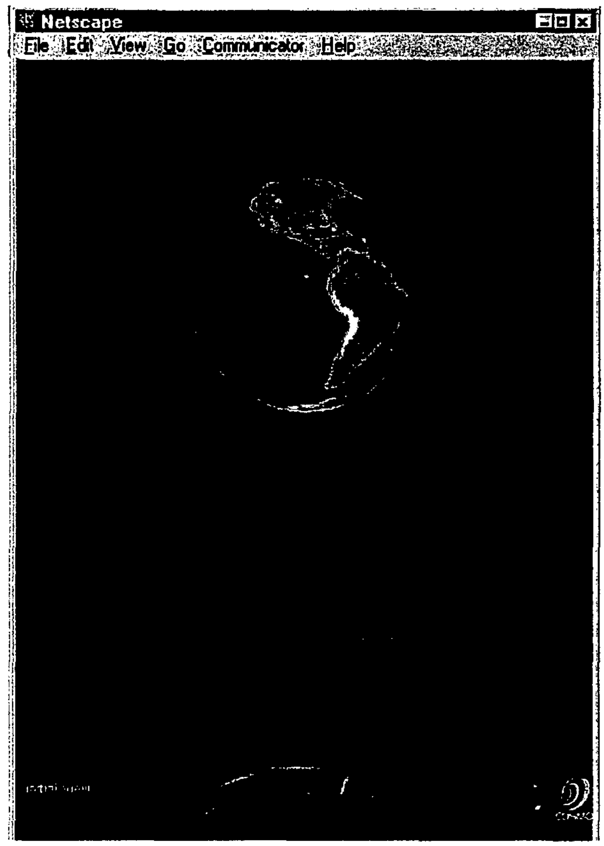

Figure 2.8. "Hello World" Source Code and Rendered World.
From (Brutzman, 1998)

worlds. PROTOs are a key mechanism for efficiently creating large and intricate virtual worlds. In order to achieve efficient code re-use, the EXTERNPROTO construct is provided to group PROTOs into libraries for network accessible storage and convenient

reference. Figure 2.8 implements several of these nodes to create a virtual earth. (Brutzman, 1998)

2. GeoVRML

The VRML specification is a powerful tool for representing 3D worlds. However, the specification does not directly represent or utilize geographic concepts, such as latitude/longitude coordinates or the corresponding navigational movement associated with these coordinate systems. GeoVRML 1.0 (www.geovrml.org) is a suite of nodes and software tools developed to simplify implementing geographic constructs in VRML97. The key components of GeoVRML are the PROTOs designed for referencing and interpolation of virtual worlds through geographic mechanisms. The GeoVRML PROTOs use underlying Java code and Script nodes to perform the physically-based calculations and perform geographic modeling. The GeoVRML suite is a Recommended Practice of the Web 3D Consortium. (Iverson, 1999)

The GeoVRML nodes carry out similar functions as the corresponding nodes found in VRML97. Figure 2.9 shows example GeoVRML code fragment used to rebuild the georeferenced virtual scene displayed in Figure 2.10.

Although the example code is missing a large number of VRML declarations needed to enact geo-referencing, the major nodes required to render the scene are present. The virtual Earth appears to be similar to the "Hello World" Earth of Figure 2.8 but is, in fact, more sophisticated. The two virtual worlds provide comparable visual depictions of the Earth, but that original "Hello World" Earth is simply a sphere wrapped in a texture map of the Earth. The Earth built in Figure 2.9 is composed of elevation grids geo-referenced by latitude and longitude. To demonstrate the power of GeoVRML, a large

inverted cone is place above Monterey, California by simply referencing its geographical coordinates. The expressive power of the geo-referenced world is further supported by its utility to easily specify geographical coordinate systems.

```
GeoViewpoint {
   geoOrigin IS geoOrigin
   geoSystem ["UTM" ,"Z11"]
   position "3905500 578200 10000000"
   orientation 1 0 0  -1.57
   description "Welcome to Monterey"   }
#Build Earth w/ GeoElev. Grid & Lat/long
  Shape {
     appearance Appearance {
      material Material {
       diffuseColor 0.8 1.0 0.3 }
       texture DEF TEX ImageTexture
                         { url "earth.gif" }}
     geometry GeoElevationGrid {
            geoOrigin IS geoOrigin
            geoSystem [ "GDC" ]
            geoGridOrigin "-90 -180 0"
            xDimension 21
            zDimension 21
            xSpacing "18"
            zSpacing "9"
            height [0 0 0 0… (441 total) ]}}
GeoLocation {
     geoSystem [ "GDC" ]
     geoCoords "36.601388 -121.88166 200000"
#----------Lat/Long Monterey CA
     children [
       Transform {
         rotation 1 0 0 3.1415926
         children [
           Shape {
            appearance Appearance {
              material Material {
                      diffuseColor 1 0 0 }}
           geometry Cone {
                      bottomRadius 100000
                            height 500000 }
} ] } ]  }
```

Figure 2.9. X3D Source Code for GeoVRMLWorld.wrl

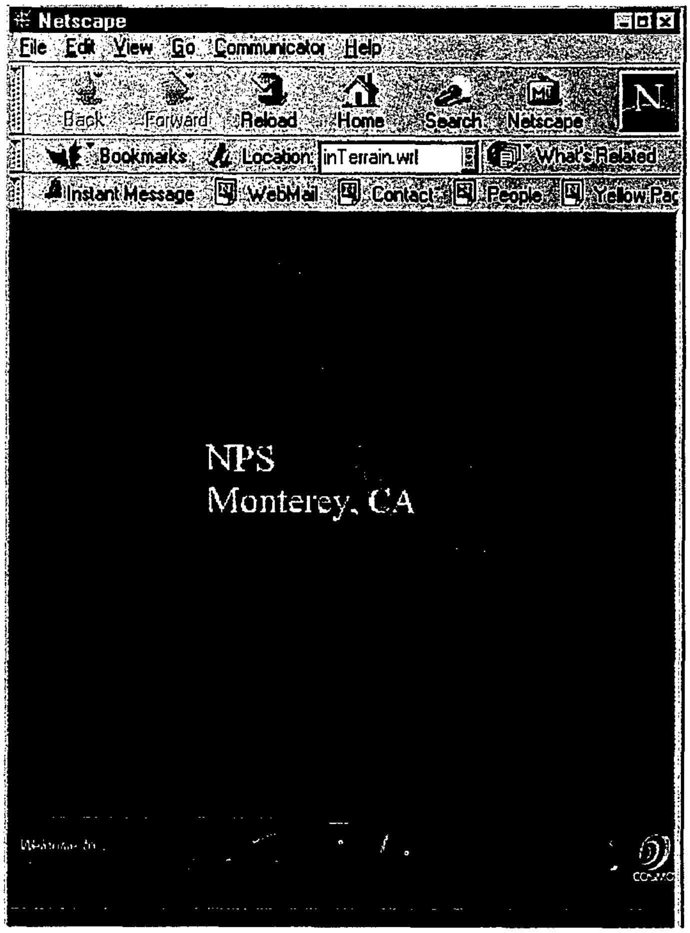

Figure 2.10. Rendered GeoVRMLWorld.wrl

a. GeoOrigin

Coordinate reference systems currently supported by the GeoVRML suite assumes that the virtual world begins at the center of the earth. In order to gain optimal precision of the model, GeoVRML provides the GeoOrigin node to specify the local

coordinate system. Only one GeoOrigin node is used within a scene, directing a browser where to look inside the VRML world and to interpret the geological data. (Reddy, 2000)

b. GeoLocation

The ability to place objects in specific locations of a scene graph is of fundamental importance. The GeoLocation node presents the capability to place objects in a virtual world using a geological reference frame. This node performs in a similar manner to the Transform node of VRML97. (Reddy, 2000)

c. GeoPositionInterpolator

The original Transform node required the PositionInterpolator node to create smooth movement for animation. The GeoLocation node also has an associated interpolator. The GeoPositionInterpolator node performs the function of calculating key values and intermediate positions in geological coordinates. A time sensor is used to drive the process that passes the coordinates to the GeoLocation node effecting movement of an object about a geo-referenced world. (Reddy, 2000)

d. GeoViewpoint

The GeoViewpoint node behaves like a standard viewpoint node. The GeoViewpoint node relocates the viewer's orientation and position to an absolute posture in the georeferenced coordinate frame. The GeoViewpoint node supplies a practical means for maneuvering about complex GeoVRML worlds.

E. EXTENSIBLE 3D (X3D)

The next-generation VRML specification is known as Extensible 3D (X3D). Extensible 3D is more than an update to VRML97; it is a redesign of the encoding and the

underlying code structure. By employing XML, the new X3D standard constructs a DTD tagset that allows users to develop well-formed and validated scene graphs. Using XML provides X3D with a robust structure and extensibility. Extensible 3D has similar fundamental nodes and structure as the VRML97 standard and is fully backward compatible.

Using an X3D software development kit and the X3D-Edit authoring tool, developers can produce validated scene graphs with error-free editing. The tool kit utilizes IBM's Xeena XML editor that has been configured to facilitate straightforward development of scene graphs that conform to X3D DTD. The X3D Edit tool converts X3D documents to VRML97 via an XSL stylesheet and automatically launches a browser for convenient debugging. Figure 2.11 shows a screen capture of the Program. (Extensible 3D Task Group, 2000)

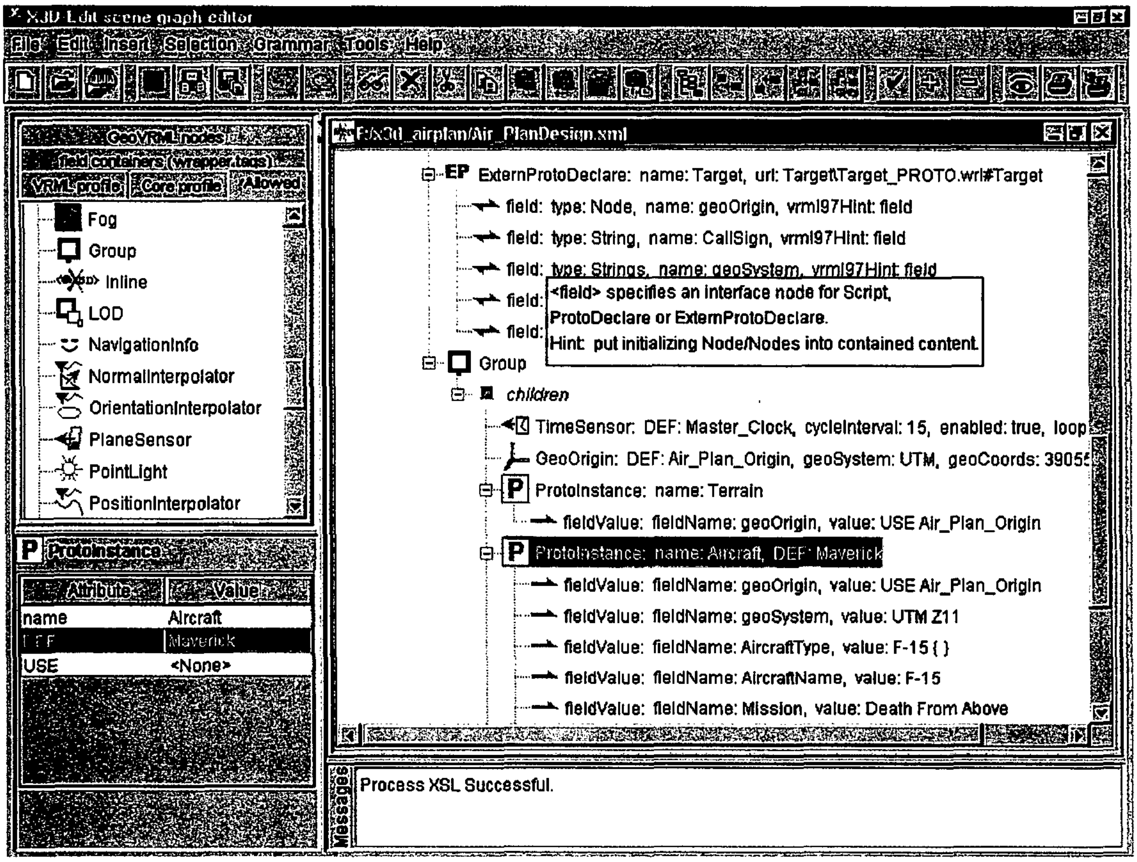

Figure 2.11. Screen Capture of X3D-Edit Tool

Extensible 3D provides the critical link between the XML documents and virtual worlds of this thesis. Although VRML97 is the basis for many of the models developed, X3D provides the structure and flexibility to transform XML documents to valid scene graphs. Figure 2.12 and Figure 2.13 show examples of X3D and VRML code that render identical virtual worlds.

```
#VRML V2.0 utf8
Group {
 children [

   Viewpoint {
        description "initial view"
        position    6 -1 0
        orientation 0  1 0 1.57 }

   Shape {
        geometry    Sphere  { radius 1 }
        appearance  Appearance{
            texture ImageTexture {
                    url "earth-topo.png"}}
         }

   Transform {
     translation 0 -2 1.25
       rotation    0  1 0   1.57
       children [

           Shape {
             geometry  Text {
              string [" Hello" "world!" ]}
             appearance Appearance {
               material Material {
                 diffuseColor 0.1 0.5 1 }}

                 }
               ]
             }
          ]
        }
```

Figure 2.12. X3D Source Code for "Hello World"

```
<X3D>
  <Scene>
     <Group >
       <Viewpoint
            description='initial view'
            orientation='0.0 1.0 0.0 1.57'
          position='6.0 -1.0 0.0'
       />
       <Shape>
          <Sphere radius='1.0'/>
              <Appearance>
                 <ImageTexture
                   url='"earth-topo.png" '
                 />
              </Appearance>
       </Shape>
       <Transform
            rotation='0.0 1.0 0.0 1.57'
            translation='0.0 -2.0 1.25'>

         <Shape>
           <Text string='"Hello" "world!"'/>
           <Appearance>
             <Material
                diffuseColor='0.1 0.5 1.0'
             />
           </Appearance>
         </Shape>

       </Transform>

    </Group>
  </Scene>
</X3D>
```

Figure 2.13. VRML Source Code for "Hello World"

F. AIR OPERATIONS PLANNING

1. The Joint Air Tasking Cycle

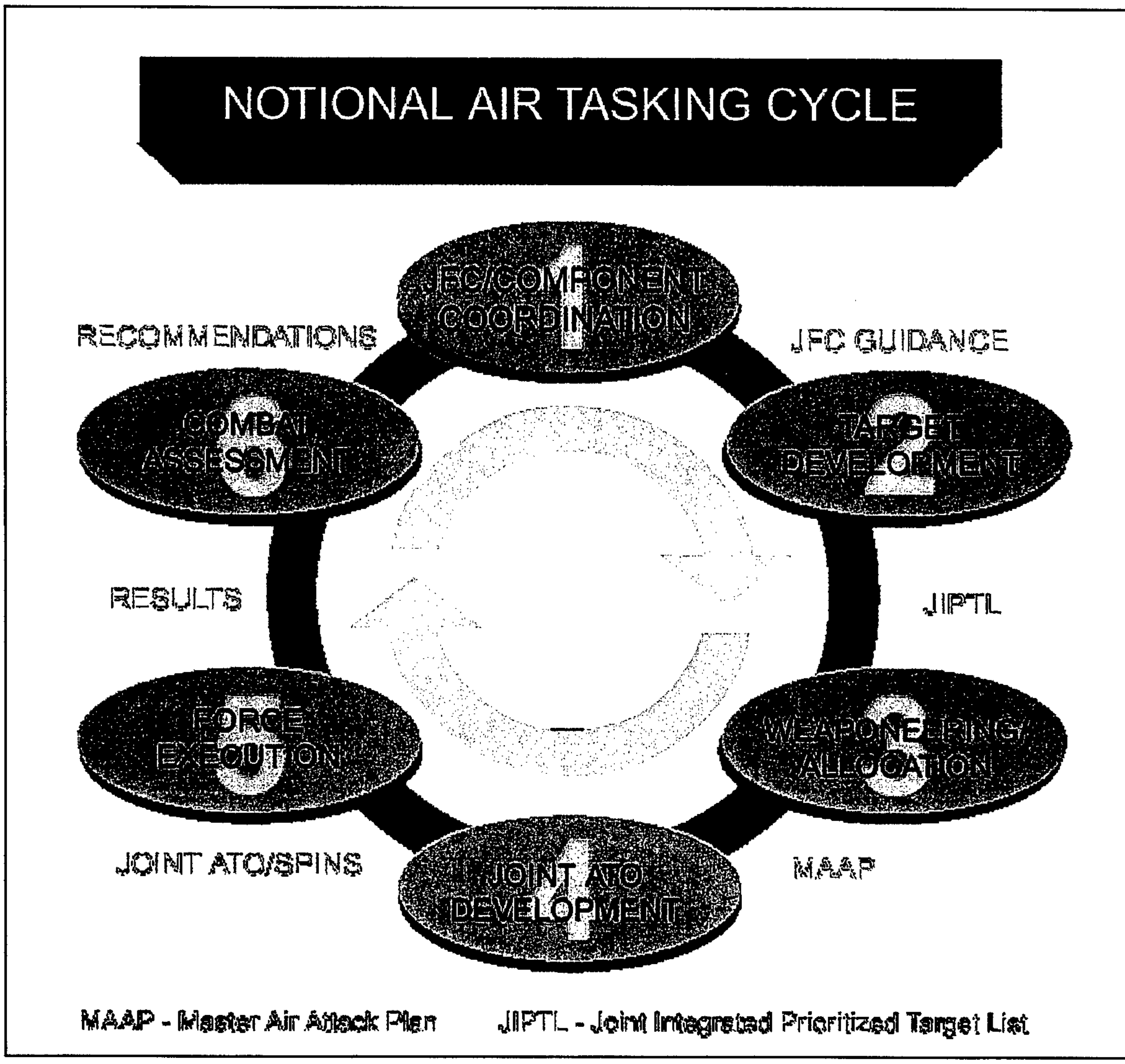

Figure 2.14. Notional Air Tasking Cycle (Joint Publication 3-56.1, 1994, pg. IV-4)

The joint air tasking cycle is the process used by the Joint Air Component Commander (JFACC) and staff to effectively employ air capabilities. The air tasking cycle is designed to be repetitive in nature, in order to accommodate changes in strategy and

changes on the tactical battlefield. As indicated in Figure 2.14, the air tasking cycle is composed of six interrelated phases. Typically the air tasking cycle lasts 72 hours: 48 hours of plan development and asset allocation, then 24 hours of execution.

The first phase of the air tasking cycle is Joint Force Commander (JFC)/Component Coordination. This is a meeting between the JFC and component commanders. During this meeting, the JFC provides strategic vision and broad guidance to the component commanders. Additionally, the component commanders have the opportunity to provide recommendations, assert support requirements, and state their ability to support other components. Specific to the air tasking cycle, the JFC (aided by the JFACC and his staff) decides upon the apportionment of joint air assets to ensure the air effort is consistent with his campaign objectives and phases. "Air apportionment is the determination and assignment of the total expected effort by percentage and/or priority that should be devoted to the various air operations and /or geographic areas for a given time period." (Joint Publication 3-56.1, 1994, pg. IV-7) The JFC's objectives and air apportionment are then passed along to the Target Development phase of the air tasking cycle.

The first task of the Target Development phase is the creation of a target nomination list that supports the JFC's targeting objectives and priorities. The Joint Air Operations Center (JAOC) then reviews the target nomination list, selects worthy targets, and prioritizes selected targets. The final target list, the Joint Integrated Prioritized Target List (JIPTL), is then distributed as the end product of the Target Development phase.

The third phase, Weaponeering/Allocation, quantifies the JIPTL into expected attack results. This assessment is based on target worksheets, which are essentially detailed attack profiles for each target. Target worksheets include target attack objectives,

target descriptions, threats, aim points, number and type of aircraft, number and type of weapon to employ, probability of target destruction, etc. Once all target assessments and worksheets are completed, the final prioritized target list is merged into the Master Air Attack Plan (MAAP).

The MAAP is the key element of joint air operations. In addition to including a target list, the MAAP contains the JFC and JFACC objective and guidance; component air support plans; component support requests; availability of capabilities/forces; aircraft allocation, and target update requests (Joint Pub. 3-56.1, 1994,pg. IV-8). The MAAP is also the foundation for the creation of Air Tasking Orders. The data within the MAAP combined with the JFC's air apportionment decision helps the JFACC/ JFC staffs to allocate the appropriate type and number of sorties for each operation or task.

Once the JFC approves the MAAP, the Joint Air Tasking Order (ATO) Development phase of the air tasking cycle begins. The Combat Plans section derives the details of the ATO, the Airspace Control Order (ACO), and Special Instructions (SPINS). The Combat Plans section must complete the ATO, ACO, and SPINS documents with the appropriate level of direction, in order for specified warfighting units to plan the fine details of their air missions.

Typically, the ATO, ACO, and SPINS are created within the Contingency Theater Automated Planning System (CTAPS) or the Theater Battle Management Core System (TBMCS) and are distributed electronically in an USMTF format. Units tasked by the ATO input the ATO, ACO, SPINS, and other information into either the Air Force Mission Support System (AFMSS) or the Tactical Aircraft Mission Planning System (TAMPS).

Unit level mission planners with the aid of AFMSS or TAMPS create of each their aircraft's air mission(s).

The Force Execution phases of the air tasking cycle starts when an ATO time period begins and sorties are flown. During an extended around-the-clock air operation, the force-execution phase occurs 24 hours a day; however, only a single ATO is executed at any one time. Throughout the force execution phase, the staffs of the JFACC and JFC direct or redirect the execution of the ongoing air operation and make any target-deconfliction decisions. If any decisions affect an ATO in the force-execution phase, the JAOC is responsible for implementing the changes to the ATO.

Changes in an ATO normally result from assessments completed in the Combat Assessment phase of the air tasking cycle. The combat assessment phase begins when the first sortie of an ATO launches and ends long after an ATO is executed. Combat assessment is done at all levels, from in-flight battle-damage assessment (BDA) reports to BDA evaluations of satellite imagery. BDA decisions about targets can directly impact sorties defined in an ongoing ATO and/or sorties in future ATOs. The combat-assessment phase allows air power to be flexible enough to respond to the changes on the battlefield.

2. Air Tasking Order (ATO)

The Air Tasking Order (ATO) is a data document that defines projected sorties, targets, and specific missions. While the ATO does not normally define the fine-level details of air mission routes, it does provide the framework for subordinate unit level planners to build coordinated air sorties. In general, ATOs supply targets, call signs, air controlling agencies, type and number of aircraft allocated to a target, etc.

Joint air planners create the ATO in either the Contingency Theater Automated Planning System (CTAPS) or the Theater Battle Management Core System (TBMCS). The final ATO is formatted in the USMTF standard to allow for the electronic distribution of the ATO to components, subordinate units, and command and control agencies. Due to the time length of the joint air tasking cycle (normally 72 hours) the JFACC staff work simultaneously on three ATOs, each of which is in a different phase approximately 24 hours apart.

3. Airspace Control Plan (ACP) and the Airspace Control Order (ACO)

The Airspace Control Authority (ACA) is responsible for developing the Airspace Control Plan (ACP). The Airspace Control Authority prepares the ACP in coordination with the Area Air Defense Commander's (AADC) area air defense plan and with other joint operation plans. The ACA develops the ACP in a manner to ensure combat operations can be executed effectively without any undue restrictions. The bottom line is the ACP defines "the safe, efficient, and flexible use of airspace" (Joint Publication 3-52, 1995, pg. v).

The Airspace Control Order (ACO) is the implementation of the Airspace Control Plan (ACP). Like the ATO, the ACO is created in either the CTAPS or TBMCS. The final ACO is also formatted in the USMTF standard to allow for the electronic distribution components, subordinate units, and command and control agencies.

G. SUMMARY

This chapter details numerous associated concepts required for the transformation of an ATO message into a virtual world. The Extensible Markup Language (XML) is a

tool that provides data structure, data transformation, and data formatting. When combined with a powerful rendering application like the Virtual Reality Modeling Language, XML has the ability to revolutionize the U.S. Message Text Format (USMTF) standard for joint and coalition messages.

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III. OPPORTUNITY STATEMENT AND IMPLEMENTATION OVERVIEW

A. OPPORTUNITY STATEMENT

Currently, Air Tasking Orders are transmitted to air wings and air squadrons in a message format call the U.S. Message Text Format (USMTF). While the USMTF program has been successful since the 1970's, its useful life is coming to end do to the development of the Extensible Markup Language (XML). The Extensible Markup Language has the ability to both transform data structures and render data structures into any format; therefore, it is created the opportunity for message users to decide how they want to view messages. Taking advantage of this opportunity, this thesis demonstrates how to transform and render an Air Tasking Order as a graphically animated virtual world.

B. PROPOSED IMPLEMENTATION

Leveraging off the work of the XML-MTF Development Team, this thesis seeks to render an air planning messages in a 3D virtual world via use of Virtual Reality Modeling Language (VRML). The foundation of a virtual air plan is an XML ATO, which is transformed by a series of stylesheets. By combining detailed flight mission data for each tasked aircraft with threat data (e.g., location of enemy Surface-to-Air-Missile (SAM) sites) and terrain data, a realistic virtual battlefield can then be created using VRML.

C. PROPOSED USES OF A VIRTUAL WORLD AIR TASKING ORDER

Representing an ATO inside a virtual world can provide operators with several advantages. Inside a virtual world, flight crews have the opportunity to view their sortie in the context of an entire ATO as well as the entire battlefield. This provides flight crews with real representations of their missions in the context of the "big picture." Additionally, flight crews can visualize difficult aspects of their missions (such as geographical limitations) within the virtual world. Finally, flight crews and unit mission planners might intuitively identify whether there exist any airspace conflicts between aircraft.

D. UNITED STATES MESSAGE TEXT FORMAT (USMTF)

The United States Message Text Format (USMTF) is a well documented, government-proprietary messaging standard used for sharing structured information. The essence of USMTF is to create an environment of information exchange, which allows joint forces and systems to achieve interoperability. The USMTF has been highly successful over the past three decades because it has enjoyed full buy-in from all DOD services, DOD agencies, national agencies, Commander-In-Chiefs (CINCs), and allies. With this strong backing, USMTF is able to support the full spectrum of military operations.

Unfortunately, USMTF is not a robust format due to one overriding limitation -- USMTF is only able to send the message itself. Under current USMTF methods and technologies, no metadata can be transmitted within the message. Without metadata, it is difficult to transform and format USMTF messages.

E. EXTENSIBLE MARKUP LANGUAGE (XML)

Unlike USMTF, which can only send the text of a message, XML allows users to create messages that contain metadata. Metadata is data that describes information. The utilization of metadata is powerful because it provides the consumers of information with the ability to transform, organize, and render data in ways that suits their needs. Additionally, XML can be the enabler of interoperability. XML provides the mechanisms to allow producers and consumers of information to more easily exchange data between applications.

F. VIRTUAL REALITY MODELING LANGUAGE (VRML)

The Virtual Reality Modeling Language (VRML) is a non-proprietary, international standard for describing virtual objects and worlds over networks. VRML is capable of representing three-dimensional (3D) animated objects and multimedia objects with hyperlinks to other media such as text, sounds, movies, and images.

G. IMPENDING REVOLUTION: DATA EXCHANGE AND INTEROPERABILITY

In previous generations the Department of Defense was the driver of technological developments. Recently, a paradigm shift has occurred and industry is now leading the technological revolution of the information age. New technologies are appearing that present the tools to solve data interoperability problems found in complex organizations. The Extensible Markup Language and the Virtual Reality Modeling Language are two recent technological developments that have the potential to impact

data structure, transmission, storage, and display. Additionally, "Virtual worlds can provide meaningful context to the mountains of content which currently exist in isolation without roads, links or order." (Brutzman, 1996)

IV. DESIGN OF AN OPERATIONAL/TACTICAL AIR PLAN

A. INTRODUCTION

This chapter outlines the tactical scenario, upon which the ATO is based, and the scenario limitations restricting the complexity of the ATO data and virtual world.

B. SCENARIO LIMITATIONS

In an effort to show the benefits of an integrated XML and VRML world, a simple attack scenario was designed to display an air plan. This scenario is completely notional and unclassified, but is sophisticated enough to demonstrate meaningful examples of XML and VRML/X3D technologies. To limit the complexity of the world, the following limitations are placed on the area of operation:

1. Aside from one airbase of the friendly force, both the enemy forces and the friendly forces are confined to Fort Irwin, also known as the National Training Center, located in southern California. This action limits both the size of the operations area and the quantity of Detailed Terrain Elevation Data (DTED) that must be imported into the VRML world.

2. Friendly force aircraft will only perform attack missions and activities. Air support activities, such as air-to-air refueling, are not described or rendered.

3. The ranges and signatures of enemy radars are not based upon any real world intelligence data. Also, the mission flight characteristics of the air platforms are not based on any formal performance specification or data.

4. Aside from enemy targets defined in the ATO and the XML threat document, no enemy ground or air assets will be represented in the VRML world.

C. SCENARIO DESCRIPTION

An enemy force has invaded and taken control of historically disputed lands in the Granite Mountains. The enemy force has created an integrated air defense by positioning two early warning radars along the high points of the Granite Mountains. As shown in Figure 4.1, the enemy has also placed numerous SAM sites throughout their occupied region. An enemy airfield, located at UTM 11N 3942150 528000, provides ground troops air support and poses a threat to friendly forces.

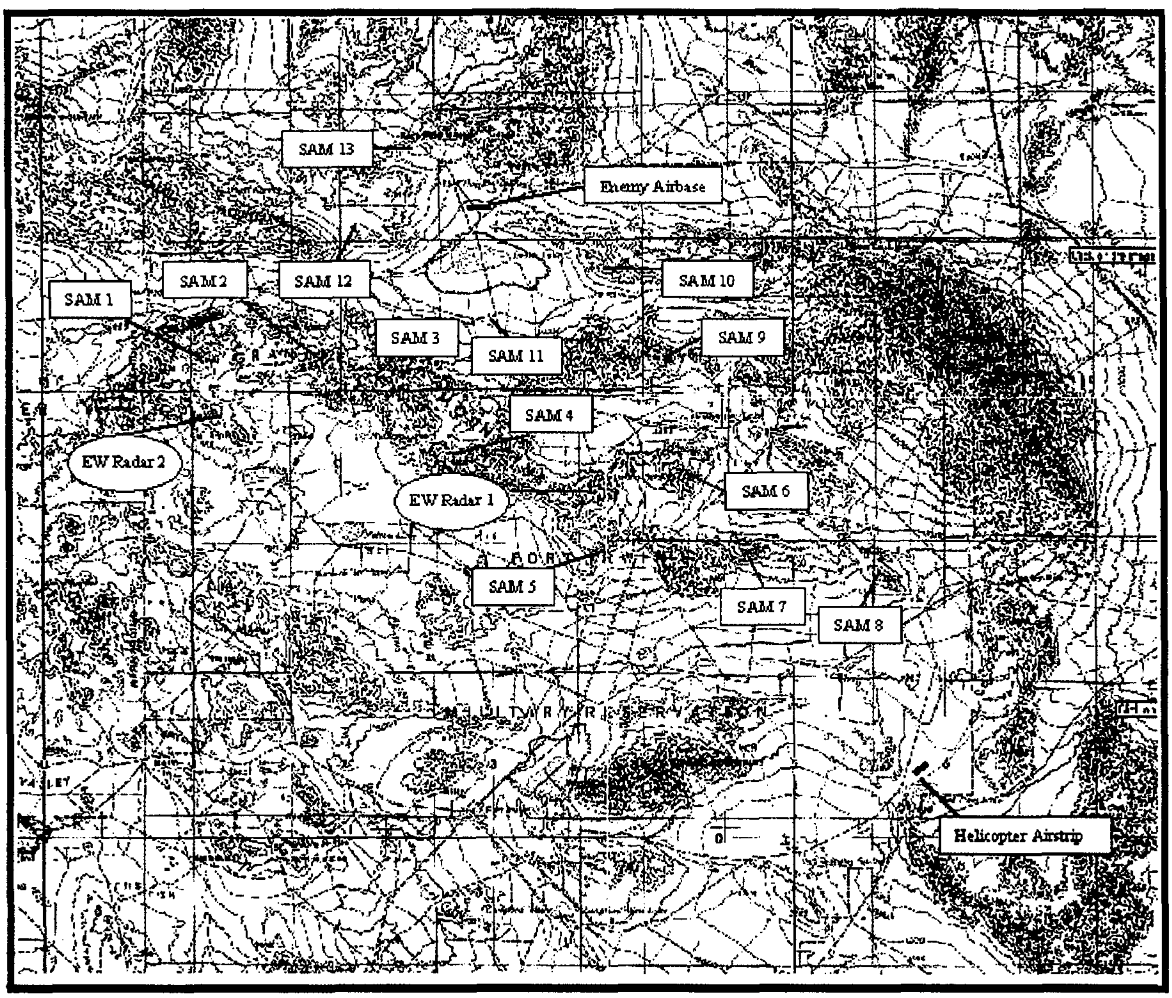

Figure 4.1. Enemy Positions in Ft. Irwin,
After (United States Geological Survey, 1969)

The friendly force has control of the region stretching south from the Granite Mountains. Currently, the friendly force is operating AH-64A Apache helicopter missions out of the airstrip located at UTM 11N 3905000 558450. Additionally, the friendly force has operational wings of F-15E Strike Eagles available for bombing missions. These wings are located to the south at UTM 11N 3795700 575950, which is located in 29 Palms.

D. FRIENDLY FORCES OBJECTIVES AND MISSION PROFILES

The overall objective for the friendly forces is to achieve air superiority. To accomplish this task, friendly forces will fly attack sorties against the enemy's early warning radars, SAM sites, and airbase. The air plan is developed to achieve air superiority will be separated into three coordinated phases.

During the first phase, Apache helicopters will attack early warning air defense radars. The mission profile will require extremely low-level flights, at approximately 30 meters above the surface, to avoid radar detection. All Apache flights will originate from the UTM 11N 3905000 558450 airstrip. Since enemy early warning air defense radars will be directing their attention toward the south, Apache sorties will conduct an end-around maneuver and attack the radars from behind. The flight profile for each Apache is shown in Figure 4.2.

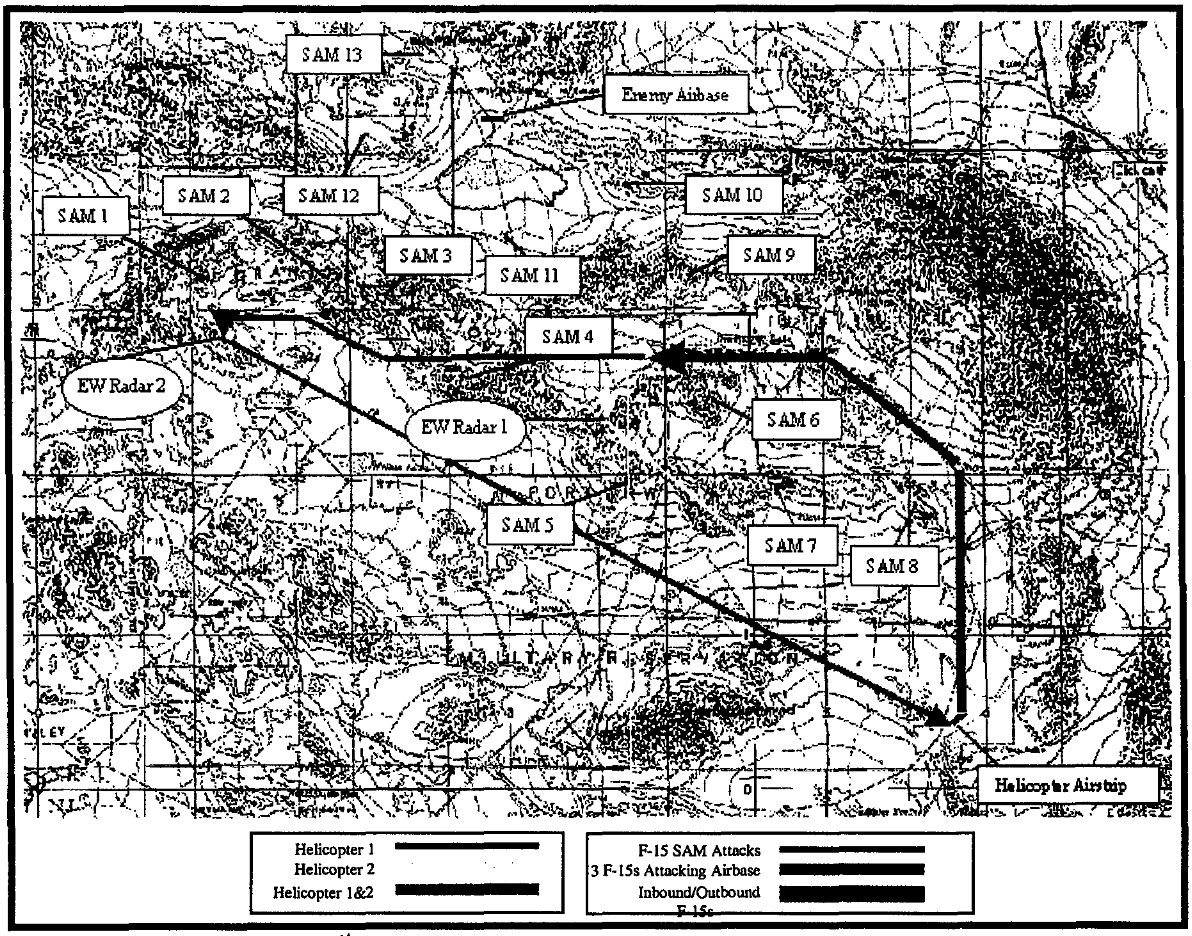

Figure 4.2. 101st Air Cavalry AH-64 Apache Helicopter Flight Patterns, After (United States Geological Survey, 1969)

As the Apaches near their targets, F-15 air sorties will be launched from the 29 Palms airbase against enemy SAM sites blocking the air corridor leading to the enemy's air base. One F-15 will be devoted to each SAM site located in the air corridor. The F-15s will approach and attack the SAM sites from altitudes above 30,000 feet as shown in Figure 4.3.

Once the air corridor is cleared, the next wave of F-15s will enter the air corridor and will fly missions to destroy the enemy's air base. These attack sorties will be flown at 20,000 feet and follow a flight pattern as depicted in Figure 4.3.

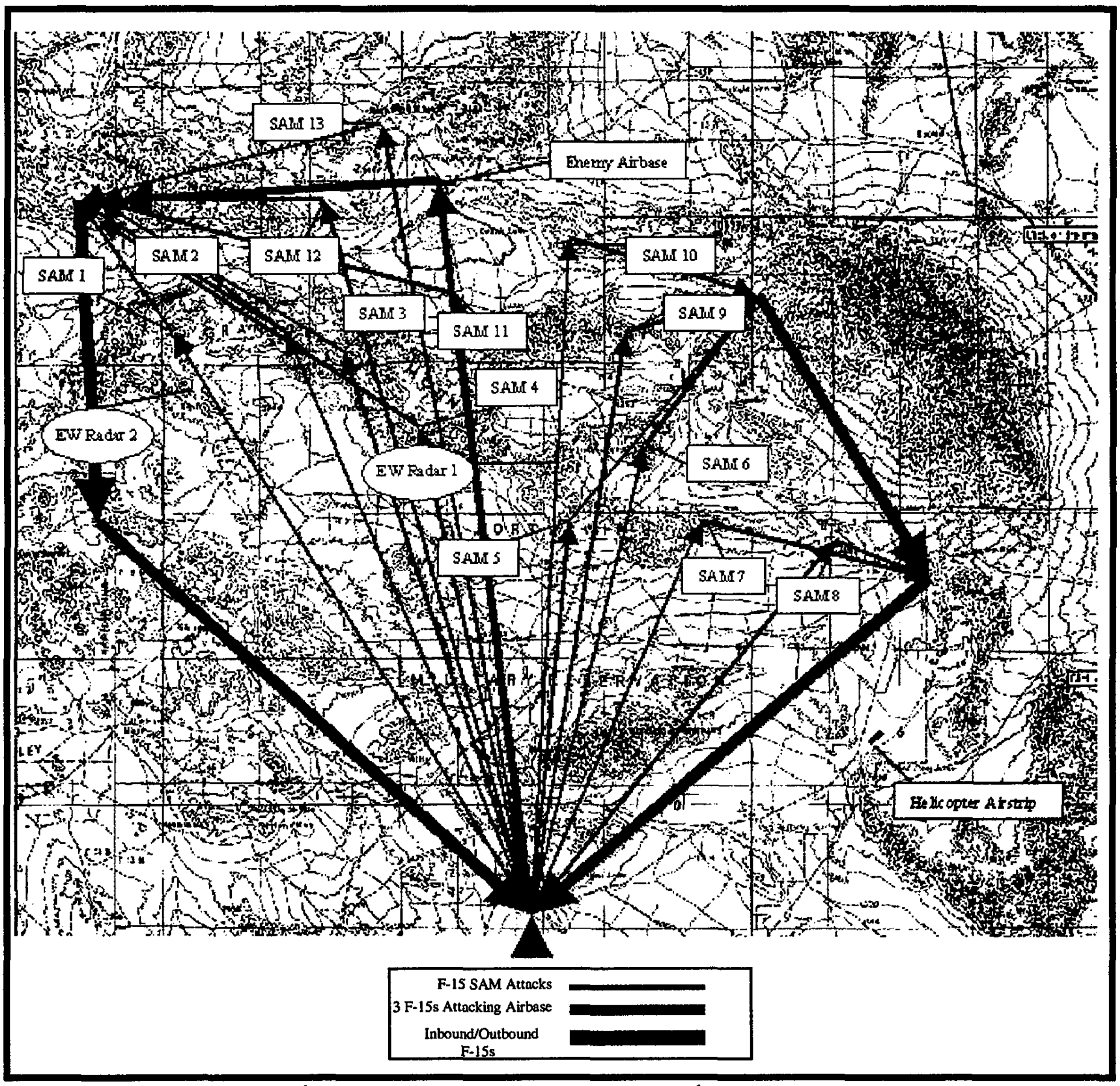

Figure 4.3. 4th Tactical Fighter Wing and 100th Tactical Fighter Wing
F-15 Flight Patterns, After (United States Geological Survey, 1969)

E. SUMMARY

To carry out an air plan within the virtual world, it is important to create a meaningful scenario that obeys the limits of complexity applied to this thesis while providing a realistic demonstration of new technologies. Ft. Irwin is the chosen area of operation because terrain data and maps are readily available. The key to representing a scenario is to describe the attack sorties in the ATO, unit flight plans, and threat data in an XML format. Once these documents are available, a virtual air plan can be created.

V. DESIGN OF AN XML/VRML AIR PLAN

A. INTRODUCTION

This chapter describes the structures and elements that are required to transform an ATO into a 3D air plan visualization. The fundamental structures of XML and USMTF bound and prescribe the data organization of this thesis. While ATO and all its derivative documents obey the principles of XML and USMTF, some data structures are slightly modified from the current draft XML-USMTF format, in order to reduce the complexity of stylesheet transformations.

To create a complex virtual air plan, a modularized design approach is applied. Each module represents detailed scene graph objects to be rendered in the virtual battlespace. This modularity allows for the auto-generation of simple scene graph code from XML documents.

B. AIR PLAN DATA STRUCTURE DESIGN

1. Information Architecture

The overall information architecture and data structures of this thesis, including the Air Tasking Order (ATO) and air mission profiles for each aircraft specified in the ATO, are bound within the constructs of the XML data tree and the USMTF message format standard. As briefly described in the XML section of Chapter II, XML documents create data trees. A simple example of a data tree is a genealogical family tree seen in Figure 5.1.

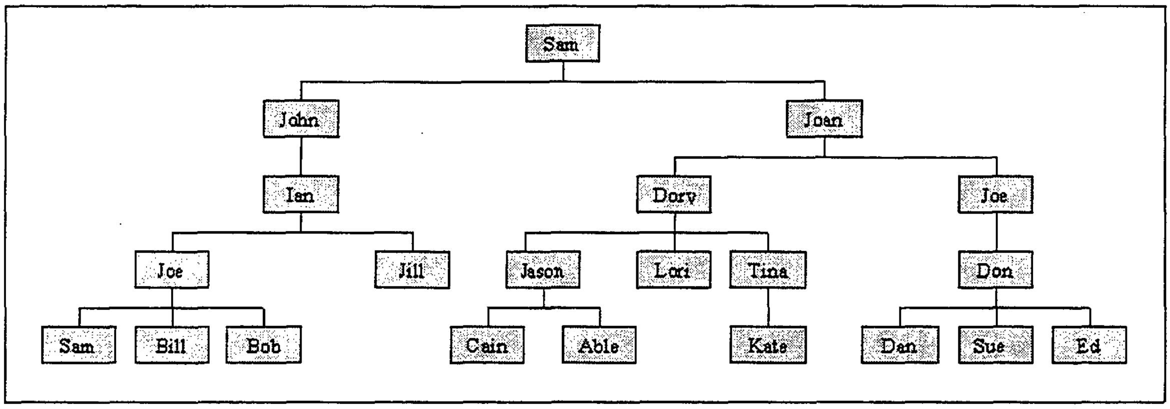

Figure 5.1. Genealogical Family Tree

The XML data tree is designed to follow a containment model. (Harold, 2000, pg. 62) Under this design, XML elements can contain attributes, data, and/or children elements. In general, it is bad form to develop element tags that contain both simple data and embedded children tags; however, attributes can be gracefully combined with elements, allowing tags to contain either data or children. (Harold, 2000, pg. 62)

The USMTF standard establishes the message format framework in which an ATO is created. The USMTF standard for ATOs supplies Joint Force Air Component Commanders (JFACCs) with a standardized format to transmit air taskings. In essence, USMTF provides the interoperability necessary for any person or system to read an ATO message.

2. Air Tasking Order (ATO) Data Structure

To achieve USMTF compliance, the XML-MTF Development Team, aided by a software tool designed to translate USMTF messages formats into Document Type Definitions (DTDs), autogenerated a DTD tagset for ATOs. This ATO DTD is the foundation for the ATO used within this thesis. Unfortunately, the automatically created

ATO DTD is enormous. When imported into Microsoft Word, the DTD contains 78,784 characters, which equates to approximately 6000 words and hundreds of element declarations. This verbose tagset is not a clear or usable result. To make data generation more manageable, a simplified ATO (SATO) DTD has been prepared and used in this thesis. The SATO DTD allows for the generation of well-formed and valid XML ATOs. This is an important issue. If an element is required by the DTD but does not appear within the XML data document, the document will fail the test of validity and cannot be parsed through XSL Stylesheets. Thus the SATO DTD is an illustrative (and more practical) alternative to the current draft ATO DTD.

A simplified ATO is also necessary to reduce the complexity of the VRML world. Only those elements needed to represent air attack sorties are contained in the ATO data structure. Data elements that revolve around support missions such as air-to-air refueling or reconnaissance missions are intentionally omitted.

Although the SATO DTD is not all encompassing, it is a straightforward subset that does contain the same structure and element names as the XML-MTF Air Tasking Order DTD. Essentially, the SATO is created by "sawing off" branches from the more complex data tree of the XML-MTF ATO DTD. The remaining data branches comprise the simplified ATO and are the branches that are required to display air attack sorties within a virtual battlespace.

While the simplified ATO DTD mirrors the elemental structure of the XML-MTF Air Tasking Order DTD, attributes are not carried over into the to the SATO DTD. The vast majority of attributes appearing within the XML-MTF ATO DTD is designed for

identification purposes and provides no further advantages to the parsing of the simplified ATO.

3. Transforming Data Structures

a. Simplified ATO (SATO)

In order to modularize the preparation of ATO-related documents, the simplified ATO DTD and XML data are both imported into a higher-level document. This higher-level document is created as a shell with only one additional element, the "air_tasking_order_root." The "air_tasking_order_root" is a parent whose presence aids the importation of both the SATO DTD and ATO XML data. The use of a shell document allows for all the necessary XSL processing instructions to be predefined. This shell also avoids a situation of having to manually insert the XSL processing instructions into every SATO XML document.

To transform a SATO into a virtual air plan, the data contained in the SATO must be transformed and modularized into two types of XML documents: ATO Header document and partial unit flight plans. The new XML documents follow the general structure of the simplified ATO DTD.

b. ATO Header Data Document

The first document created from a SATO is the ATO Header Data document. This XML document's DTD is a partial copy of the SATO DTD and contains only the elements that describe identification and time parameters. When transforming a SATO in an ATO Header Data document, the root element of the ATO, `air_tasking_order`, is transformed by a stylesheet into the ATO Header Data document's root element, `ato_header_data`.

c. *Partial and Final Unit Air Plans*

The second type of documents that are created from the SATO is the partial and final air plans for each unit specified within the SATO. Initially, unit air plans are in a partial form because the SATO only provides tasking information for a unit's aircraft. As described in Section E of Chapter II, the units are responsible for using the information contained in the SATO to create detailed flight missions within the Air Force Mission Support System (AFMSS) or Tactical Aircraft Mission Planning System (TAMPS).

Aside from the detailed flight missions, the data contained within both the partial air attack plan and the final air attack plan maintain a similar structure to the simplified ATO. The exceptions to the structure are several parent nodes, such as `tasked_country_segment`, `tasked_country`, etc. which is not carried over from the SATO into the unit air attack plans. However, the children of each parent node containing data are transferred into the unit air attack plans. The deletion of these two parent nodes is performed in order to simplify the data structure. These two parent nodes serve no purpose within the unit air attack plan data sets. Also, the root element of the SATO is transformed into the root element of the unit air plan.

A unit's final air plan is created once the detailed flight plans for each of the units' aircraft are entered into the partial air plan. The detailed flight data is constructed to contain two fundamental components: the waypoint location, and the time of day when the waypoint is reached. These two data components are separated from each other in different parent nodes as shown in Figure 5.2.

```
<route_field_group>
  <route_point_route>
    <point_and_altitude route_point_number="0">
      <route_point_utm_1_meter>
        <utm_grid_zone_designation>11</utm_grid_zone_designation>
        <utm_grid_zone_hemisphere>N</utm_grid_zone_hemisphere>
        <utm_grid_zone_row>39</utm_grid_zone_row>
        <utm_100000_meter_square_row>05</utm_100000_meter_square_row>
        <utm_1_meter_northing>500</utm_1_meter_northing>
        <utm_grid_zone_column>5</utm_grid_zone_column>
        <utm_100000_meter_square_column>59</utm_100000_meter_square_column>
        <utm_1_meter_easting>000</utm_1_meter_easting>
      </route_point_utm_1_meter>
      <route_point_altitude_in_meters>174</route_point_altitude_in_meters>
    </point_and_altitude>
                              •
                              •
                              •
    <point_and_altitude route_point_number="5">
      <route_point_utm_1_meter>
        <utm_grid_zone_designation>11</utm_grid_zone_designation>
        <utm_grid_zone_hemisphere>N</utm_grid_zone_hemisphere>
        <utm_grid_zone_row>39</utm_grid_zone_row>
        <utm_100000_meter_square_row>05</utm_100000_meter_square_row>
        <utm_1_meter_northing>500</utm_1_meter_northing>
        <utm_grid_zone_column>5</utm_grid_zone_column>
        <utm_100000_meter_square_column>59</utm_100000_meter_square_column>
        <utm_1_meter_easting>000</utm_1_meter_easting>
      </route_point_utm_1_meter>
      <route_point_altitude_in_meters>0</route_point_altitude_in_meters>
    </point_and_altitude>
  </route_point_route>
  <time_of_position_route>
    <cumulative_ato_time_in_seconds
route_point_number="0">0</cumulative_ato_time_in_seconds>
    <cumulative_ato_time_in_seconds
```


Figure 5.2. Waypoint Locations and Waypoint Arrival Times

An alternative structure, as shown in Figure 5.3, is to have each waypoint contain both location and time.

```
<route_field_group>
  <route_point_altitude_in_hundreds_of_feet> 0
</route_point_altitude_in_hundreds_of_feet>
  <time_of_position_route>
    <cumulative_ato_time_in_seconds> 0 </cumulative_ato_time_in_seconds>
  </time_of_position_route>
  <route_point_route>
    <route_point_number> 0 </route_point_number>
    <route_point_utm_1_meter>
      <utm_grid_zone_designation>11</utm_grid_zone_designation>
      <utm_grid_zone_hemisphere>S</utm_grid_zone_hemisphere>
      <utm_grid_zone_column> 05 </utm_grid_zone_column>
      <utm_100000_meter_square_column> 59   </utm_100000_meter_square_column>
      <utm_1_meter_easting> 0000 </utm_1_meter_easting>
      <utm_grid_zone_row> 39 </utm_grid_zone_row>
      <utm_100000_meter_square_row> 05 </utm_100000_meter_square_row>
      <utm_1_meter_northing> 5000 </utm_1_meter_northing>
    </route_point_utm_1_meter>
  </route_point_route>
</route_field_group>
```

Figure 5.3. Alternative Waypoint Data Structure

The alternative waypoint data structure is more difficult to parse into VRML code. The VRML code for ATO representation requires the waypoint times and locations to be separated into different fields as shown in Figure 5.4. The chosen waypoint data structure in Figure 5.3 is easier to convert into VRML.

```
DEF EARLYBIRD2
Aircraft {
        geoOrigin USE AirPlan_Origin
        geoSystem ["UTM", "Z"]
        AircraftName "APACHE"
        AircraftType [ APACHE {Top_Description **EARLYBIRD2**} ]
        CallSign "EARLYBIRD2"
        MissionNumber "EWRADAR02"
        Mission "INT"
        TakeoffPosition "3905500 559000 0"
        WayPoints["3905500 559000 0"
                  "3905500 559000 9.15"
                  "3923500 536500 9.15"
                  "3923500 536500 9.15"
                  "3905500 559000 9.15"
                  "3905500 559000 0"
                 ]
        WayPointTime[ 0
                      0.00370
                      0.40389
                      0.57056
                      0.97075
                      0.97446
                    ]
}
```

Figure 5.4. VRML Waypoint Structure

d. Threat Data Document

The threat data document provides the last set of XML data that is required to display an air plan in a virtual battlespace. This document is not derived from the SATO; however, its data structure is related to both the SATO and finalized unit air attack plans. The threat data document defines each threat known in the area of operation by identifying the type of threat (i.e., early warning radar) and the positional data of each threat. To develop a more realistic data structure, future work must identify how intelligence threat data is best structured and expressed.

e. Master Operational Document (MOD)

The final XML document used within this thesis is the Master Operational Document (MOD). The DTDs and XML documents for the ATO Header Data, Threat Data, and all final unit air attack plans are imported into the MOD. Therefore, the MOD's data structure is defined by the DTDs of each imported document.

C. VIRTUAL AIR PLAN DESIGN

1. Overview

Designing the virtual battlespace is a matter of determining which elements of the air plan offer the visual contexts necessary to construct a 3D world. Once the visual elements are determined, the air-plan data is translated and expressed as PROTOS in a scene graph structure. The key to building a complex virtual air plan from auto-generated code is modularity. Grouping the air plan elements into macro-sized modules simplifies the translation process and allows for simpler object generation.

2. Visual Elements

The most obvious elements to translate into the virtual air plan are ones that denote shapes. If an air plan tasks an F-15 fighter, then the virtual air plan must display a representation of that aircraft. There is no need to translate directly to individual shapes or intricate surfaces. The auto-generated code can reference complex structures to be rendered (such as an F-15 Eagle aircraft) by a single name.

The virtual battlespace also uses less-apparent visual elements. Unit information crucial to the understanding of visual cues is captured from the XML air plan. Such information includes aircraft call signs, mission numbers, and mission types. These

elements are displayed as text on a heads-up-display that is attached to each visual object (e.g., each aircraft). The textual information is an important assist for interpreting a potentially complex and confusing visual picture.

3. Animation Elements

The virtual air plan is made dynamic by animating objects. These animation elements must be derived from tasking waypoints in the XML Air Plan. The take-off position and waypoint elements are the essential ingredients to bring a virtual air plan to life. The aircraft position is interpolated between waypoints and is moved at a speed of advance calculated from the associated waypoint arrival times. These elements can also be used to supply visual indications of flight routes and target assignments.

4. Elements of the Virtual Air Plan

The virtual air plan is classified into three groups. The first group contains terrain and geographic information. The autogeneration and mapping of terrain is a complex process and a separate area of active work. Because of this complexity, the air plan takes place over a static location. Although the air plan can be moved to any part of the world, only the fixed location will contain accurate and defined terrain representation.

The second group is aircraft elements. An aircraft's shape and animation elements are pulled from the XML air plan and placed into a scene graph format. The data structure in Figure 5.5 encompasses all of the information needed to render and fly an aircraft within a virtual battlespace. These elements are grouped together so that information is compartmentalized and multiple aircraft can be rendered and referenced in a single world without confusion.

```
<Aircraft>
     <Aircraft_Type>
     <Call_Sign>
     <Mission_Nmber>
     <Mission_Type>
     <Take_off_Position>
     <Waypoints>
```

Figure 5.5. Elements required to render a flying aircraft

The last group to be classified in this thesis is the target elements. Targets are less complex to render and contain fewer elements than moving aircraft. The only data elements required to render target are target type (needed to reference a corresponding structural model), and a target location.

```
<Target>
     <Target_Type>
     <Target_Location>
</Target>
```

Figure 5.6. Elements required to render a Target

5. Virtual Air Plan Composition

The 3D air plan design is composed of three parts: the autogenerated 3D air plan, visual model libraries, and behavior libraries. The auto-generated 3D air plan is the data elements parsed from the XML air plan and restructured to conform to a scene graph format. Figure 5.7 illustrates the various elements of the virtual air plan.

The visual model library is comprised of all the named macro elements required to render visual components of the air plan. This library is populated with aircraft models, target models, and track symbology. The behavior library compiles the events and actions that take place in the virtual air plan. These actions include flying in a georeferenced world and presenting heads-up displays. These libraries allow the autogenerated 3D air plan to be composed of basic elements that reference complex geometric structures and animation.

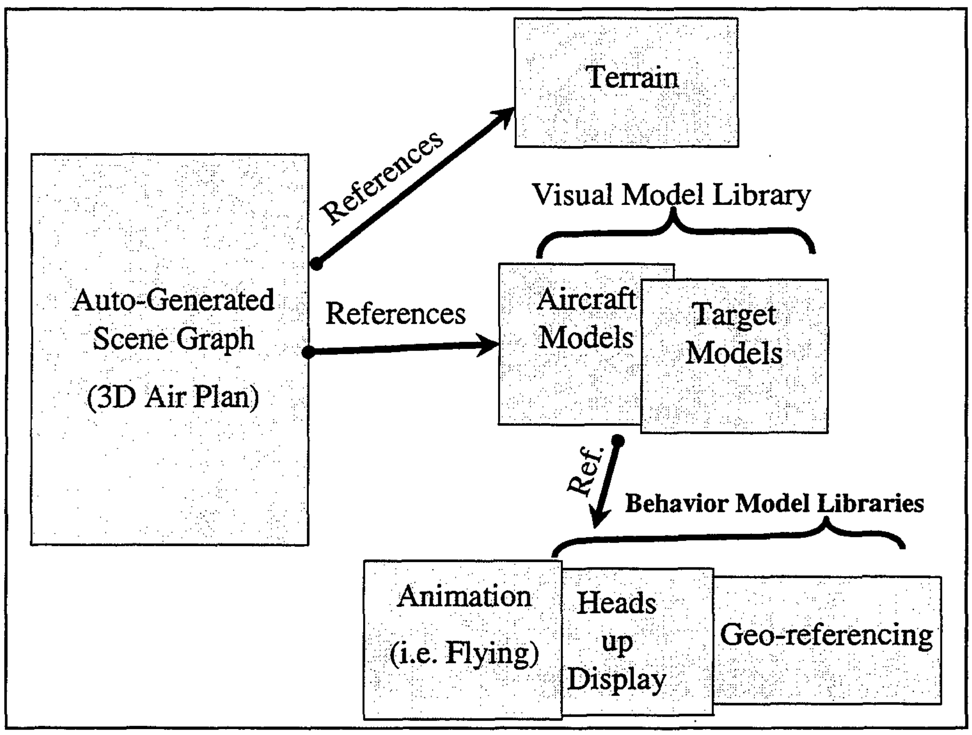

Figure 5.7. Relationships of Virtual air plan Components

6. Virtual Battlespace Navigation

The virtual battlespace is composed of multiple levels of detail controlled by predefined viewpoints. The entry-level viewpoint high above the 3D scene appears to present a two-dimensional animated map of the air plan. This first level provides an overhead view of the theater with elements represented by track symbology. The second level of viewpoints supplies a more complex level of detail by simply moving closer to various areas of the theater and rendering actual entities (instead of symbology).

There are multiple relative viewpoints attached around each aircraft object. The position of these viewpoints moves with the aircraft as it flies and gives a relative visual perspective of its relationships to the terrain and to other aircraft. The last set of predefined viewpoints present multiple side looking and oblique angles that give a depth perspective of the terrain and the altitude-assignment stratification of the air plan. These world-fixed viewpoints offer convenient navigation and enhanced understanding of the aircraft, target and terrain interaction.

D. SUMMARY

To manage the process of constructing an air plan within a virtual battlespace, it is imperative to define basic data structures and scene graph elements. Not only is this good practice, but also the structures offer convenient manipulation of data. This chapter described the simple structures and elements that are used in this thesis for the transformation of an ATO into an exemplar 3D air plan.

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VI. IMPLEMENTATION OF AN XML ATO TO A VRML AIR PLAN

A. INTRODUCTION

This chapter describes precisely how to convert an XML Air Tasking Order (ATO) into VRML source code. In order to provide a virtual battlespace air plan, several data processing steps must be traversed to produce VRML code. From the starting point of the simplified ATO (SATO), relevant data are extracted from the SATO, modularized, reconstituted and combined with other XML data documents to produce VRML source code. Figure 6.1 provides an overview of the entire process.

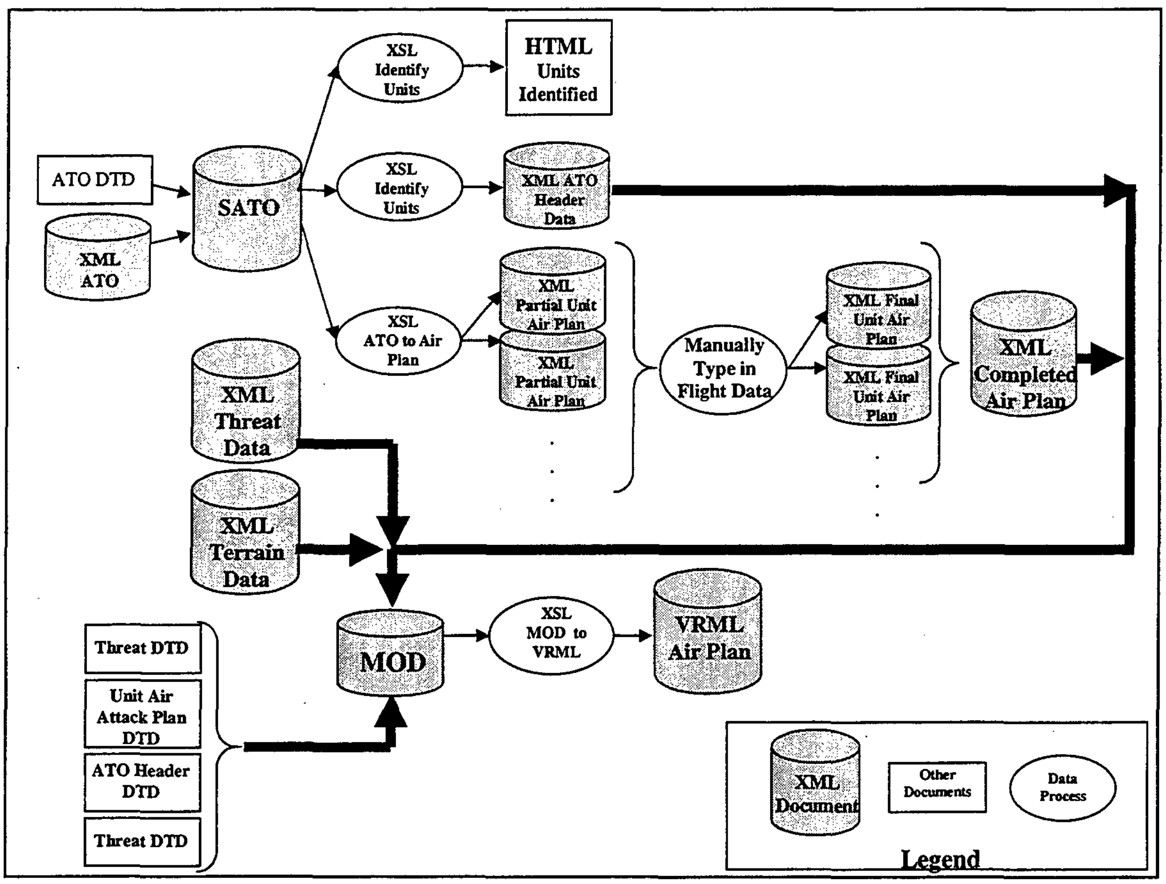


Figure 6.1. ATO Data Conversion to a VRML Based Air Plan

B. XML/XSL PARSERS

An application called an XSL parser is at the heart of all the data processing. An XSL parser traverses an XML data tree and executes XSL rules contained in a stylesheet. While many different XSL parsers exist, this thesis uses the Instant Saxon implementation (Kay, 2000). The choice of Instant Saxon is based on the following:

1. Instant Saxon is a complete implementation of the XML specification.
2. Instant Saxon has been proven to be very robust. The developers of the Extensible 3D X3D Edit program, a sophisticated XML-based application, have successfully used Saxon.
3. It runs on the Windows platform. Executables are also available for other operating systems.
4. The program is free for commercial and non-commercial use.
5. Instant Saxon is easy to use and install.
6. Saxon has extensive documentation, examples, and source code available.

Instant Saxon is invoked from an operating system command line. An example command line is shown in Figure 6.2 and follows the format of:

```
saxon [options] source.xml style.xsl
```

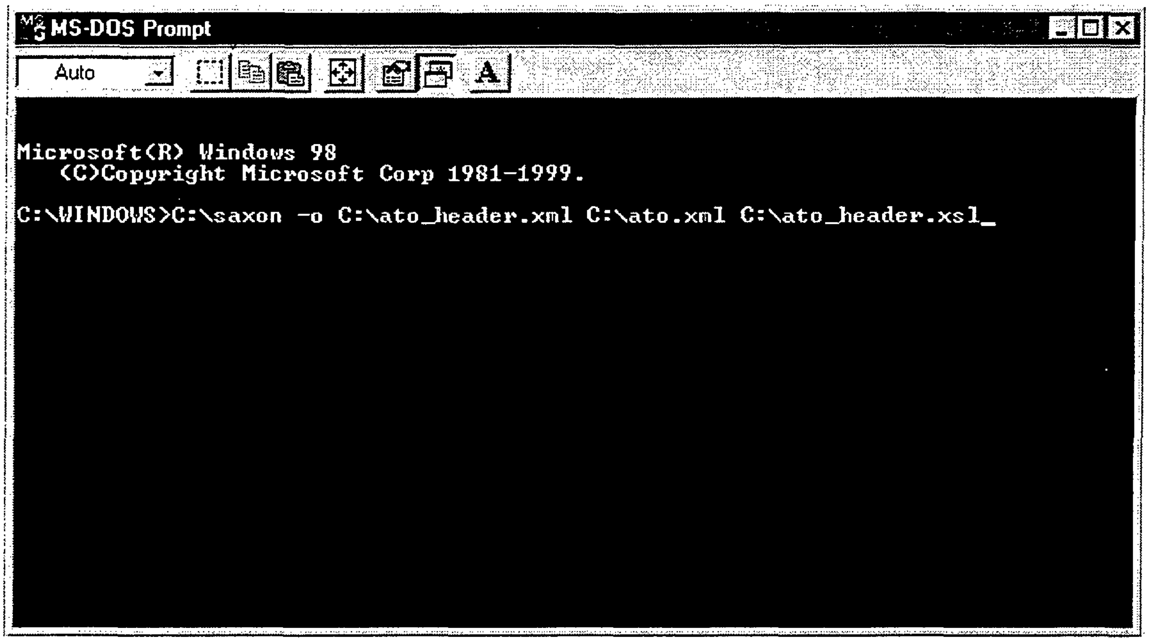


Figure 6.2. Example of an Instant Saxon Command Line

The phrase "`C:\saxon`" identifies the location and name of the Instant Saxon executable file. The phrase "`-o C:\ato_header.xml`" is an option that tells Instant Saxon to create an output file with the name of "`ato_header.xml`". There are several more options available to programmers, but the output option is the only one used in this thesis. The remaining components of the command line, "`C:\ato.xml`" and "`C:\ato_header.xsl`" identify the location and names of the source ATO and the conversions-stylesheet files.

To adequately understand the parsing of the ATO and the Master Operational Document (MOD), readers must be acquainted with the file structure used in these files. To make things as simple as possible, all the files are stored in a single folder named "`Demo`".

C. XSL PARSING OF THE ATO TO IDENTIFY TASKED UNITS

Before the ATO is divided into modularized XML documents, the stylesheet must identify which air units have been tasked within the ATO. Additionally, the caretaker of the Master Operational Document (MOD) must also identify all the units specified in the ATO. This step is required to create the entity calls, which import DTDs and XML data.

To identify units tasked in an ATO, a simple stylesheet named "`units_in_ato.xsl`" is created to display all unit designator names inside a Hypertext Markup Language (HTML) file. In this thesis, the HTML file is named "`units_in_ato.html`" for consistency purposes. This file can be viewed in either a web browser or a text file editor.

The stylesheet works by applying HTML tags at the root node. Many tags simply recur on children tags. The parser traces through the branches of the ATO that contain the "`tasked_unit_designator`." The stylesheet simply applies HTML paragraph tags around the value of "`tasked_unit_designator`." Figure 6.3 shows a condensed version of the stylesheet. The entire stylesheet can be found in Appendix F.

```
<xsl:template match="/">
  <html>
<xsl:apply-templates/>
  </html>
</xsl:template>

      •
      •
      •

   <xsl:template match="tasked_country_segment">
      <xsl:apply-templates/>
   </xsl:template>

            •
            •
            •

         <xsl:template match="service_tasked_segment">
         <xsl:apply-templates/>
         </xsl:template>

            <xsl:template match="task_unit_and_location_segment">
               <xsl:apply-templates/>
            </xsl:template>

               <xsl:template match="tasked_unit_and_location">
                  <xsl:apply-templates/>
               </xsl:template>

                  <xsl:template match="tasked_unit_designator">
                     <P>
                        <xsl:value-of select="."/>
                     </P>
                  </xsl:template>

                     •
                     •
                     •

</xsl:stylesheet>
```

Figure 6.3. Condensed `units_in_ato` Stylesheet

To process the ATO with the "`units_in_ato.xsl`" stylesheet, the following single command is typed into an operating system command line:

```
C:\ISaxon\saxon.exe -o C:\Demo\units_in_ato.html C:\Demo
\ATO.xml C:\Demo\units_in_ato.xsl
```

Once "`units_in_ato.html`" is created, users can open the file and review the results within a text file editor or a web browser.

D. XSL PARSING OF THE ATO TO CREATE AN ATO HEADER DATA DOCUMENT

To begin breaking the ATO into modularized pieces, the data that constitutes the header data is extracted from the ATO and put into a separate file. The caretakers of the MOD complete this task. Under the design of the demonstration, the unit mission plans have no need for the ATO header data.

As represented in Figure 6.4, the "`ato_header_data.xsl`" stylesheet is applied to the ATO and creates another XML document called "`ato_header_data.xml`." The arrow represents the stylesheet that transforms the SATO's data into the ATO header data document. Aside from a change in the root element names, the new document maintains the same data, XML tag names, and structure as the corresponding header data in the ATO. The "`ato_header_data.xsl`" stylesheet, which can be found in Appendix J, simply traverses the ATO header branches of the SATO and places all the data and XML tags into the "`ato_header_data.xml`" document.

To process the SATO with the ATO header data stylesheet, the following command is typed into an operating system command line:

```
C:\ISaxon\saxon.exe -o C:\Demo\ato_header_data.xml C:\Demo
\ATO.xml C:\Demo\ato_header_data.xsl
```

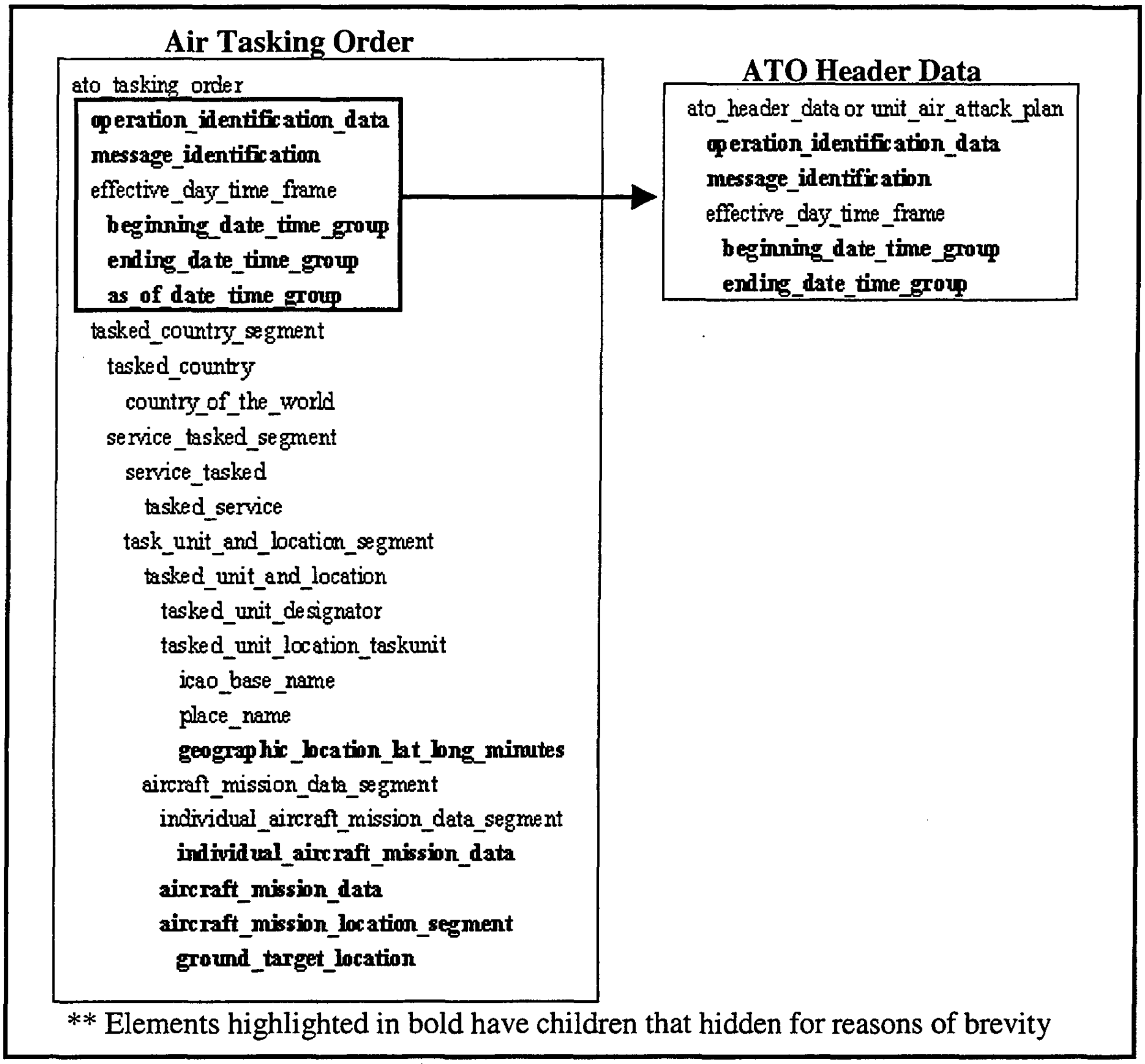


Figure 6.4. Representation of the ATO Header Data Stylesheet Transformation

E. XSL PARSING OF THE ATO TO CREATE A PARTIAL AIR PLAN

The second type of document created from the ATO is partial air plans. A partial air plan is produced for each unit that the SATO tasks. As represented in Figure 6.5, the stylesheet parses only data that individual units need to create their attack sorties, thereby reducing redundancies in elements and data. Partial air plans are a necessary intermediate step because the SATO does not contain any detailed flight data. It is up to

each unit to create their own unit air plan from the Master ATO. This job can likely be further simplified by condensing the DTD for the Master ATO DTD to eliminate unnecessary redundancies.

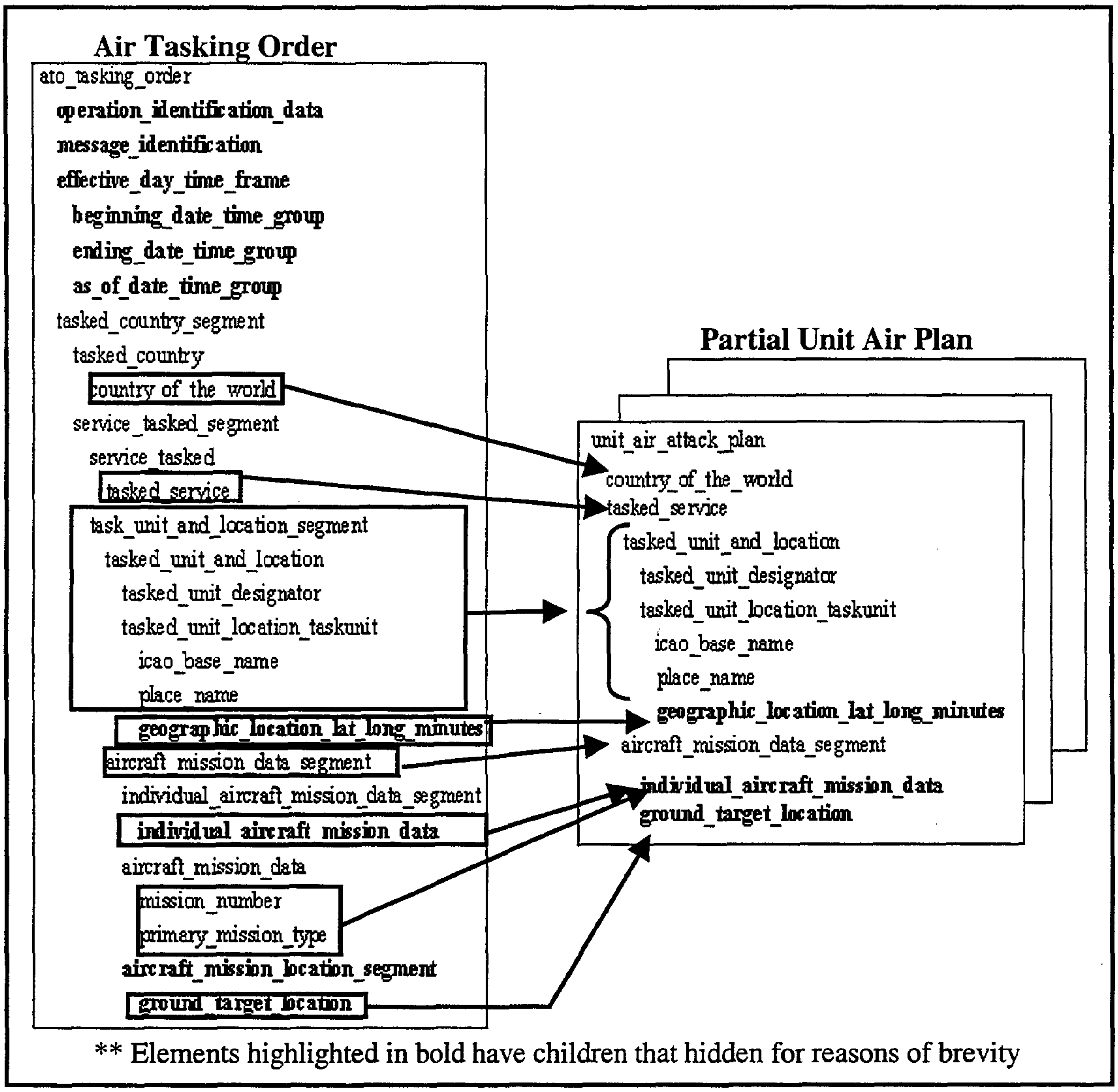


Figure 6.5. Representation of the ATO Header Data Stylesheet Transformation

Unit stylesheets are designed to create modularized partial air plans from the SATO for each unit. Each unit must have its own unique stylesheet in order to capture only the data pertaining to their unit's aircraft. This is accomplished through the use of three XSL "choose" statements. As seen in the condensed stylesheet in Figure 6.6, a unit can be uniquely identified within the ATO by the values contained in the elements `country_of_the_world`, `tasked_service`, and `tasked_unit_designator`.

```
<xsl:template match="air_tasking_order_root">
  <xsl:apply-templates/>
</xsl:template>

 <xsl:template match="air_tasking_order">
   <unit_air_attack_plan>
     <xsl:apply-templates/>
   </unit_air_attack_plan>
 </xsl:template>
         .
         .
         .
   <xsl:template match="tasked_country_segment">
    <xsl:choose>
     <xsl:when test="tasked_country/country_of_the_world='USA'">
       <xsl:apply-templates/>
     </xsl:when>
    </xsl:choose>
   </xsl:template>
         .
         .
         .
       <xsl:template match="service_tasked_segment">
          <xsl:choose>
             <xsl:when test="service_tasked/tasked_service='USAF'">
                <xsl:apply-templates/>
             </xsl:when>
          </xsl:choose>
       </xsl:template>
                 .
                 .
                 .
           <xsl:template match="task_unit_and_location_segment">
              <xsl:choose>
                 <xsl:when test="tasked_unit_and_location/tasked_unit_designator='4TFW'">
                    <xsl:apply-templates/>
                 </xsl:when>
              </xsl:choose>
           </xsl:template>
                 .
                 .
                 .
</xsl:stylesheet>
```

Figure 6.6. Condensed Partial Air Plan Stylesheet
Showing the Identification of the U.S. Air Force 4th Tactical Fighter Wing

To process the ATO with a unit's stylesheet, the following command is typed into an operating system command line:

```
C:\ISaxon\saxon.exe -o C:\Demo\4TFW_partial_air_plan.xml C:\Demo
\ATO.xml C:\Demo\4TFW_air_attack_plan.xsl
```

F. CREATION OF FINAL UNIT AIR ATTACK PLANS

To convert the partial air plan into a final air plan, a low-technology approach is followed. Each aircraft's flight plan, to include waypoints, altitudes, and times, is manually typed into a unit's partial air plan as part of the `mission_routing_data` branch. Once every aircraft's flight mission is entered into the unit's partial air plan, the final unit air plan is completed. This process is shown in figure 6.7.

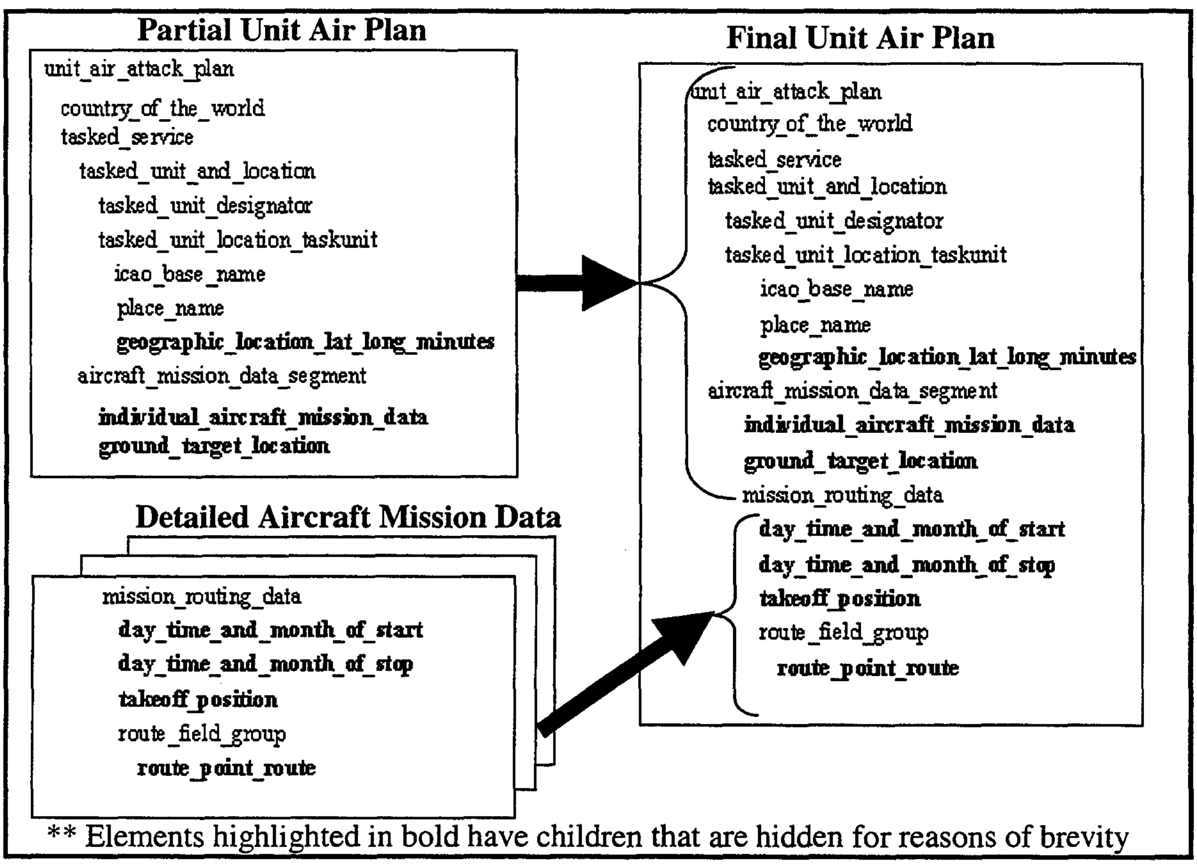


Figure 6.7. Creation of Final Air Plans

G. MASTER OPERATIONAL DOCUMENT (MOD)

The MOD is a shell document used as a kind of integration template, where all the modularized DTDs and XML documents are imported and combined. The importation of DTDs and XML documents are accomplished through the use of external-entity XSL declarations within the MOD. The reconstitution of the DTDs and XML documents from various components is illustrated in the Figure 6.8.

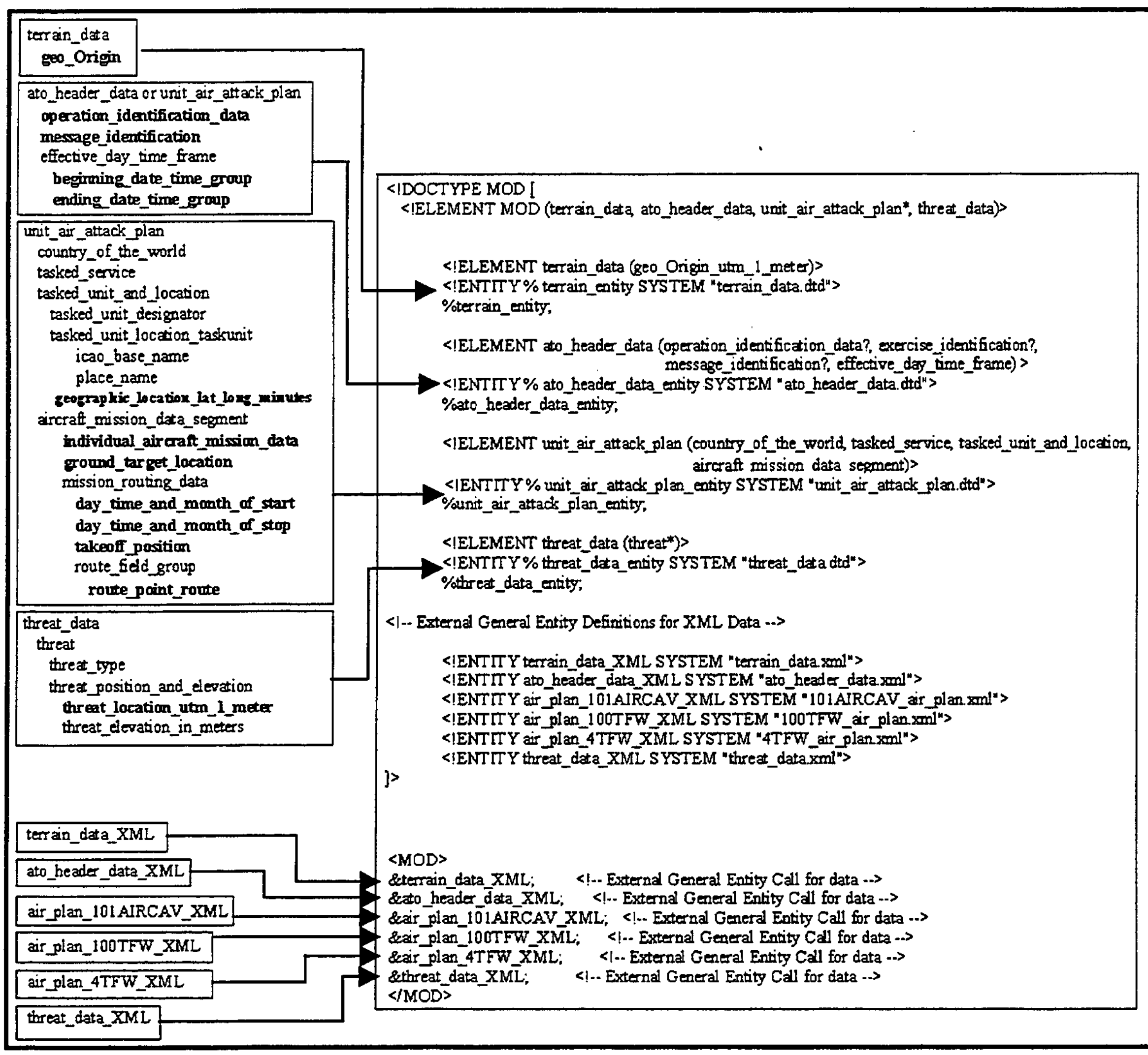


Figure 6.8. Representation of Master Operational Document

H. XSL PARSING OF THE MOD INTO VRML

The final step in creating a virtual-battlespace air plan is transforming the MOD into VRML source code. Like any other XML transformation, a stylesheet is applied to the MOD. Although the MOD contains terrain and ATO header data, these documents are excluded from the air plan's current representation within the VRML world. Therefore, the stylesheet concentrates on parsing out two fundamental components – aircrafts and threats.

Each aircraft is comprised of three components: aircraft waypoint location, waypoint arrival times, and aircraft identification data. All the aircraft data has been structured in a manner to allow for the easiest parsing. The stylesheet travels through the MOD data tree and selects the values of key elements with "value-of" statements. An example is shown in Figure 6.9. The threat data is similarly transformed by the stylesheet.

To process the MOD with a VRML conversion stylesheet, the following command is typed into the command line:

```
C:\ISaxon\saxon.exe -o C:\Demo\VRML_air_plan.wrl C:\Demo
\MOD.xml C:\Demo\MOD_to_VRML.xsl
```

Once the VRML source code is created, users can navigate through the virtual-battlespace air plan with a VRML browser.

```
<xsl:template match="route_field_group">
  <xsl:apply-templates/>
</xsl:template>

  <xsl:template match="route_point_route">
    <xsl:text disable-output-escaping="yes">
          Waypoints[</xsl:text><xsl:apply-templates/><xsl:text disable-output-escaping="yes">]</xsl:text>
  </xsl:template>


    <xsl:template match="point_and_altitude">
      <xsl:text>&quot;</xsl:text><xsl:apply-templates/><xsl:text>&quot;</xsl:text><xsl:text>   </xsl:text>
    </xsl:template>

      <xsl:template match="route_point_utm_1_meter">
        <xsl:apply-templates/>
      </xsl:template>

        <xsl:template match="utm_grid_zone_row">
          <xsl:value-of select="."/>
        </xsl:template>

        <xsl:template match="utm_100000_meter_square_row">
          <xsl:value-of select="."/>
        </xsl:template>

                    .

                    .

                    .

        <xsl:template match="utm_1_meter_easting">
          <xsl:value-of select="."/><xsl:text> </xsl:text>
        </xsl:template>

      <xsl:template match="route_point_altitude_in_meters">
        <xsl:value-of select="."/>
      </xsl:template>
```

Figure 6.9. Waypoint Parsing

I. SUMMARY

This chapter describes how ATO information is divided and distributed among derivative documents. These documents are combined with a threat data document to create a Master Operation Document. The MOD contains the data of the detailed air plan that is transformed into VRML source code via a stylesheet.

VII. IMPLEMENTATION OF THE VIRTUAL-BATTLESPACE AIR PLAN

A. INTRODUCTION

The virtual-battlespace air plan is implemented with the Virtual Reality Modeling Language. Although many other methods exist for displaying 3D worlds, such as Java 3D, VRML offers a non-proprietary, international standard for describing virtual objects and worlds over networks. The virtual world is viewed in a standard web-browser environment with freely available add-on software such as Cosmo Player or Cortona. Another advantage of VRML is its ability to utilize the GeoVRML Recommended Practice that provides convenient geo-referencing functions. The virtual air plan is made of modularized code (i.e., PROTOs) that renders the virtual world.

B. VIRTUAL AIR PLAN COMPOSITION

1. PROTO Modularization

The virtual air plan is autogenerated with modular VRML code known as PROTOs. The PROTO code is stored in separate files and is only instantiated in the virtual world. This allows the virtual world to call up and pass data to the PROTOs. The three main PROTOs referenced by the virtual air plan are the Aircraft PROTO, Target PROTO, and the Terrain PROTO. Each of these PROTOs calls upon other PROTOs to perform specific functions, such as turning on a Heads-Up Display (HUD). Figure 7.1 illustrates several of the PROTOs developed to render the virtual air plan.

The figure depicts the PROTO hierarchy necessary for such modularity. These PROTOs contain all the information required to render objects and behaviors in the

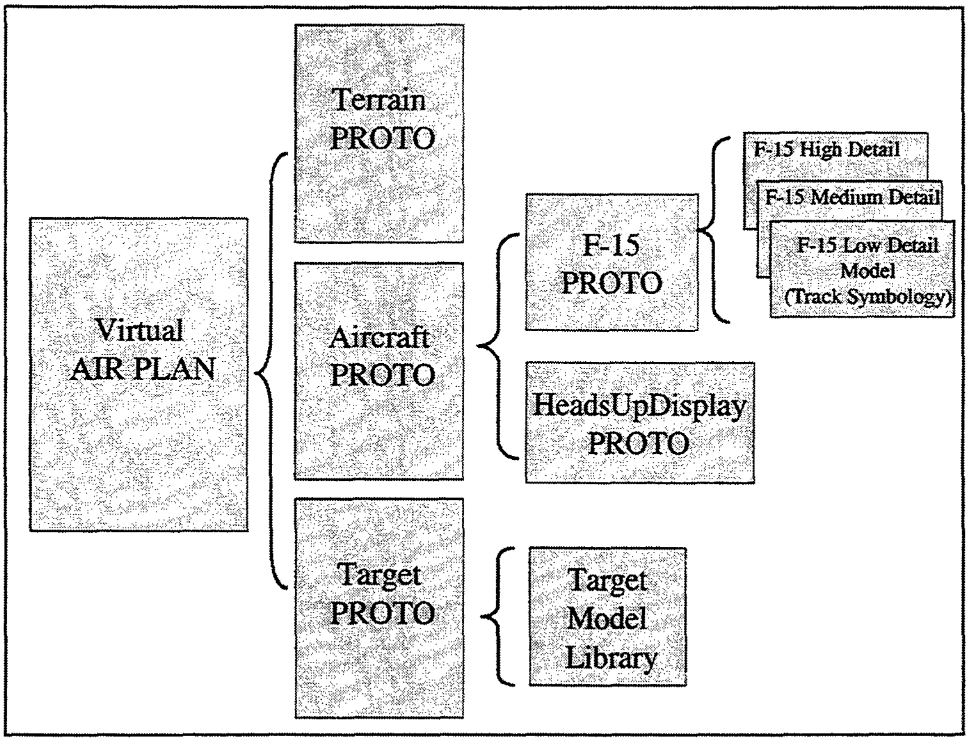


Figure 7.1. Relationship of PROTOs Used to Generate the Virtual-Battlespace Air Plan

virtual world. Every time the virtual air plan tasks an aircraft or target, the virtual world calls on the appropriate PROTO to render objects and maintain contextual information.

2. Virtual Composition

The virtual air plan is composed of four parts. The first part is made of the EXTERNPROTO declaration statements. These statements permit the air plan to access the PROTO libraries, which contain aircraft, target, and terrain models, as well as GeoVRML functions. The second set of PROTOs is the terrain and global sensors. These PROTOS are unvarying and provide global information for the entire world. Aircraft and target PROTO instantiations compile the third part of the virtual world.

Each instantiation contains information to identify each object. The final section consists of the ROUTE that plugs the global timeserver clock into each aircraft instance to drive the animation process. The last two sections show renderings of various different XML air plans. Figure 7.2 shows the structure of the virtual air plan with associated example code.

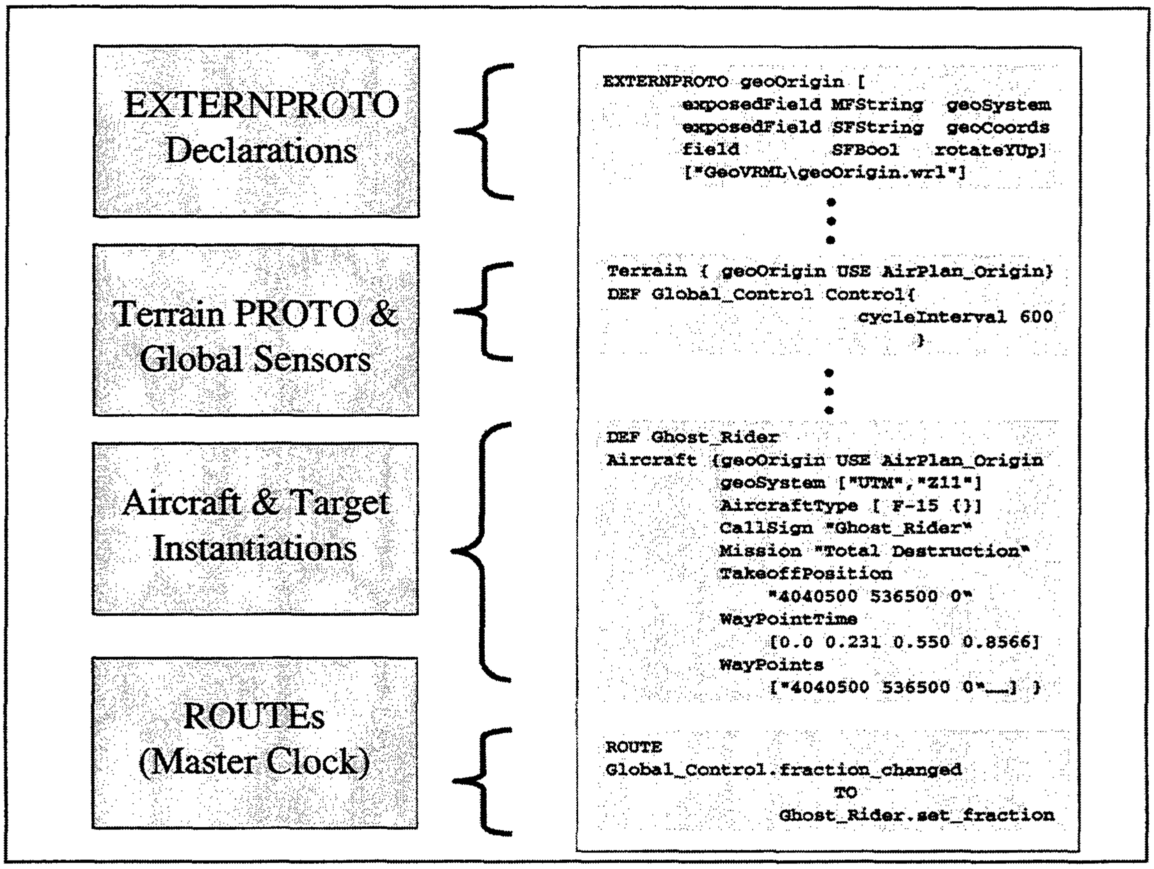


Figure 7.2. Virtual Air Plan Structure

C. AIRCRAFT PROTO

In order to simplify rendering of aircraft in the virtual world, a single Aircraft PROTO was developed. The Aircraft PROTO is responsible for accessing the aircraft model and flying behavior libraries. Since all aircraft behave in a similar fashion, the Aircraft PROTO offers a convenient interface between the virtual world and the library functions. The Aircraft PROTO receives data from the virtual air plan, calls up the aircraft specified, and flies it from waypoint to waypoint. The Aircraft PROTO maintains the characteristic information about each aircraft (such as Call Sign), and passes the data onto the Heads-Up Display (HUD).

The Aircraft PROTO file is comprised of EXTERNPROTO declarations, node interface, main PROTO body, HUD and ROUTES. The EXTERNPROTO declarations reference the aircraft model library and a larger set of GeoVRML functions. The declarations are not actually contained inside the Aircraft PROTO definition but are enumerated at the top of the file.

The first section of the Aircraft PROTO definition is the node interface. This interface defines the data that is passed into and out of the PROTO. The data passed into each instantiation PROTO must exactly match the same field names and data types described in the original interfaces. This allows the PROTO to strictly control the flow of information without error.

The main body of the VRML scene performs the actual work of flying the aircraft. The GeoLocation node is used in conjunction with the GeoPositionInterpolator node to animate the flying of an aircraft. The GeoLocation node places the aircraft at the data point given in the TakeoffPosition field of the node interface. The

GeoPositionInterpolator node then calculates the aircraft's position based on the waypoint location and waypoint arrival time. The new position is routed into the GeoLocation node to actuate the aircraft movement.

Next, the Aircraft PROTO instantiates the HeadsUpDisplay PROTO. Data from the virtual air plan, such as Mission Type, is copied into the HUD interface. The display only appears when a viewer places a pointer over the aircraft. This is accomplished through the use of a GeoTouchSensor.

The last section contains the ROUTE nodes. The master clock from the virtual world connects to the GeoPositionInterpolator to drive the animation process. The GeoPositionInterpolator sends position values into the GeoLocation node to move the aircraft. The GeoTouchSensor couples up with the HeadsUpDisplay node to turn the display on and off. Figure 7.3 shows an AH-64 Apache with the HUD displayed. Figure 7.4 illustrates the Aircraft PROTO sections and associated VRML code. The arrows depict the ROUTEs connecting each of the nodes.

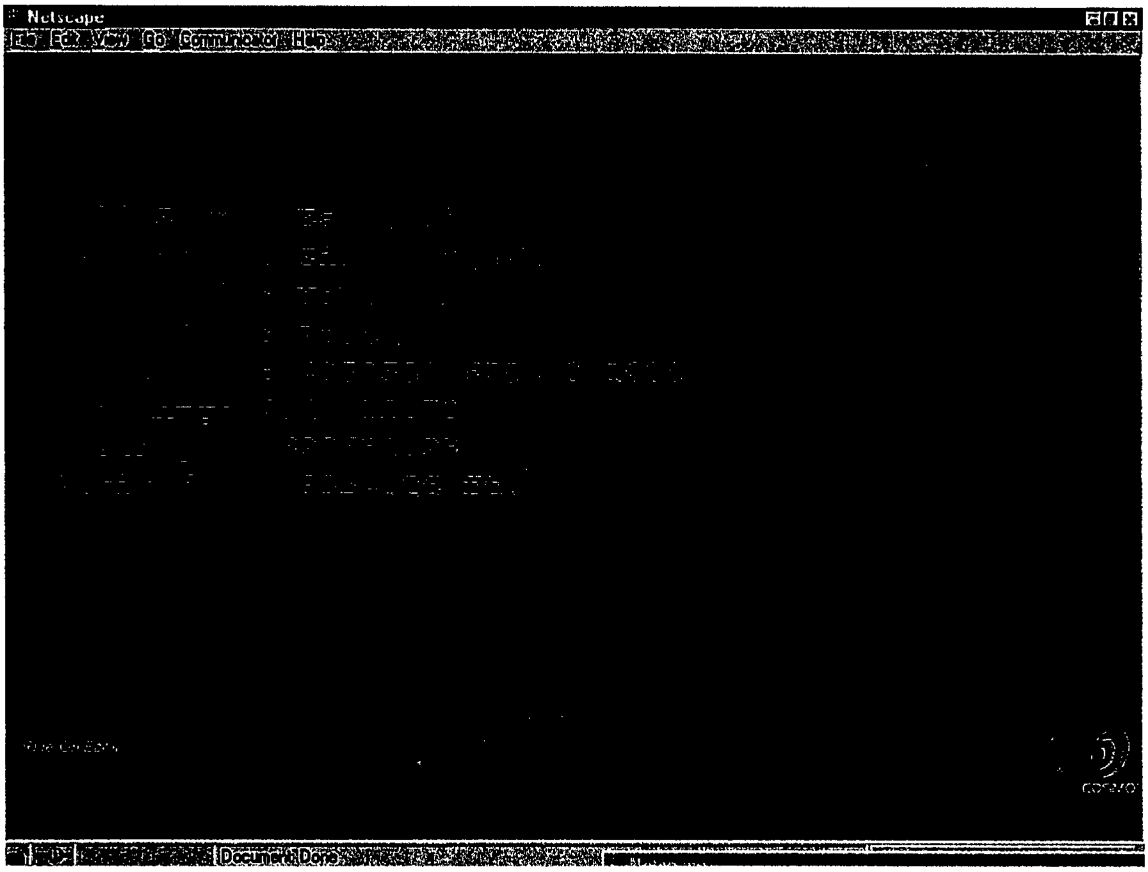


Figure 7.3. Flying Behind an AH-64 Apache with HUD Displayed.

ROUTEs

Turn HUD ON/OFF

Update Position

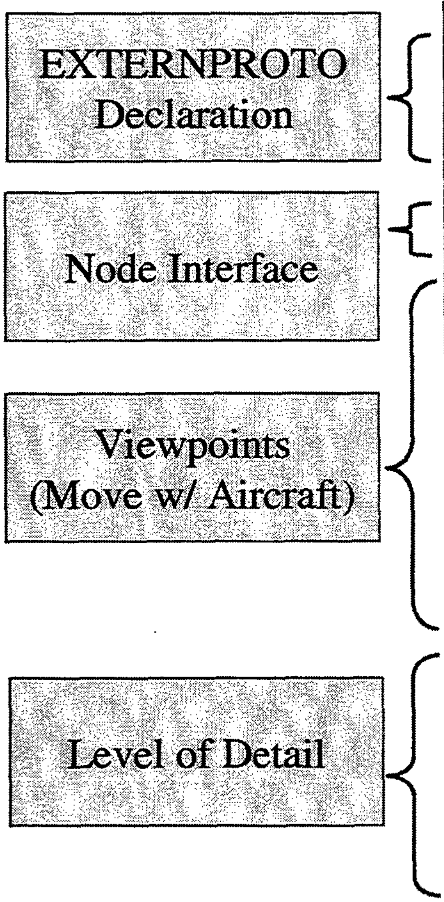
Display Position

```
PROTO Aircraft [
        field   SFNode     geoOrigin NULL
        field   MFString   geoSystem ["UTM"]
        field   MFNode     AircraftType [ ]
        field   SFString   CallSign "NoSign"
        field   SFString   Mission "NoMission"
        field   SFString   MissionNumber "NoNumber"
        field   SFString   TakeoffPosition ""
        field   MFString   WayPoints [ "" ]
        field   MFFloat    WayPointTime [ ]
        eventIn SFFloat    set_fraction
                                                        ]
{ #--BEGIN Aircraft PROTO

Group {
   children [
      DEF GeoTouch GeoTouchSensor {
                      geoOrigin IS geoOrigin
                      geoSystem IS geoSystem  }

      DEF GeoPosInt GeoPositionInterpolator {
                    geoOrigin    IS geoOrigin
                    geoSystem    IS geoSystem
                    key          IS WayPointTime
                    keyValue     IS WayPoints
                    set_fraction IS set_fraction}

     DEF GeoPos  GeoLocation {
                     geoOrigin IS geoOrigin
                     geoSystem IS geoSystem
                     geoCoords IS TakeoffPosition
                     children  IS AircraftType  }

     DEF HUD Display {
               CallSign         IS CallSign
               Mission          IS Mission
               MissionNumber    IS MissionNumber
               TakeoffPosition IS TakeoffPosition
                                        }#--HUD
       ] }

ROUTE  GeoTouch.isOver  TO  HUD.turnOn
ROUTE GeoPosInt.geovalue_changed TO
                                  GeoPos.set_geoCoords
ROUTE GeoPos.geoCoords_changed  TO
                                  HUD.set_geoCoords
} # END Aircraft PROTO
```

Figure 7.4. Aircraft PROTO with ROUTE wiring for event passing

D. AIRCRAFT MODEL CONTROL PROTO

The Aircraft Model Control PROTO is responsible for organizing all the models of a specific type of aircraft into one easy accessible node. The PROTO controls the level of detail to be displayed in the virtual battlespace. A low-detail model is displayed in the high Viewpoints, and progressively higher detail models are displayed as the Viewpoints move progressively closer to the aircraft. Mobile Viewpoints that remain attached relative to the aircraft are also established in this PROTO. An example PROTO is the F-15 PROTO shown in Figure 7.5. This PROTO calls on the various models displayed in Figure 7.6.




```
EXTERNPROTO F-15_High [ ]
                  ["F-15_High.wrl#F-15_High"]
EXTERNPROTO F-15_Medium [ ]
                  ["F-15_Medium.wrl#F-15_Medium"]
EXTERNPROTO F-15_Low [ ]
                  ["F-15_Low.wrl#F-15_Low"]

PROTO F-15 [
     field SFString Top_Description "F-15_PROTO"]

{#--Begin F-15
Group {
 children [
   Viewpoint {description IS Top_Description
              position 500.0 50000.0 0.0
              orientation 1.0 0.0 0.0 -1.57   },

   Viewpoint {description "Directly OverHead"
              position 15.0 500.0 0.0
              orientation 1.0 0.0 0.0 -1.57   },

   Viewpoint {description "Ride On Back"
              position 3800 2000 0
              orientation -0.30 0.91 0.30 1.67 }

Transform {
   children [
        LOD {
             range [ 10000,100000]
             level [F-15_High {} ,
                    F-15_Medium  {} ,
                    F-15_Low {}  ]    }# End LOD
             ]  }   ]   }
}# END F-15
```

Figure 7.5. F-15 PROTO

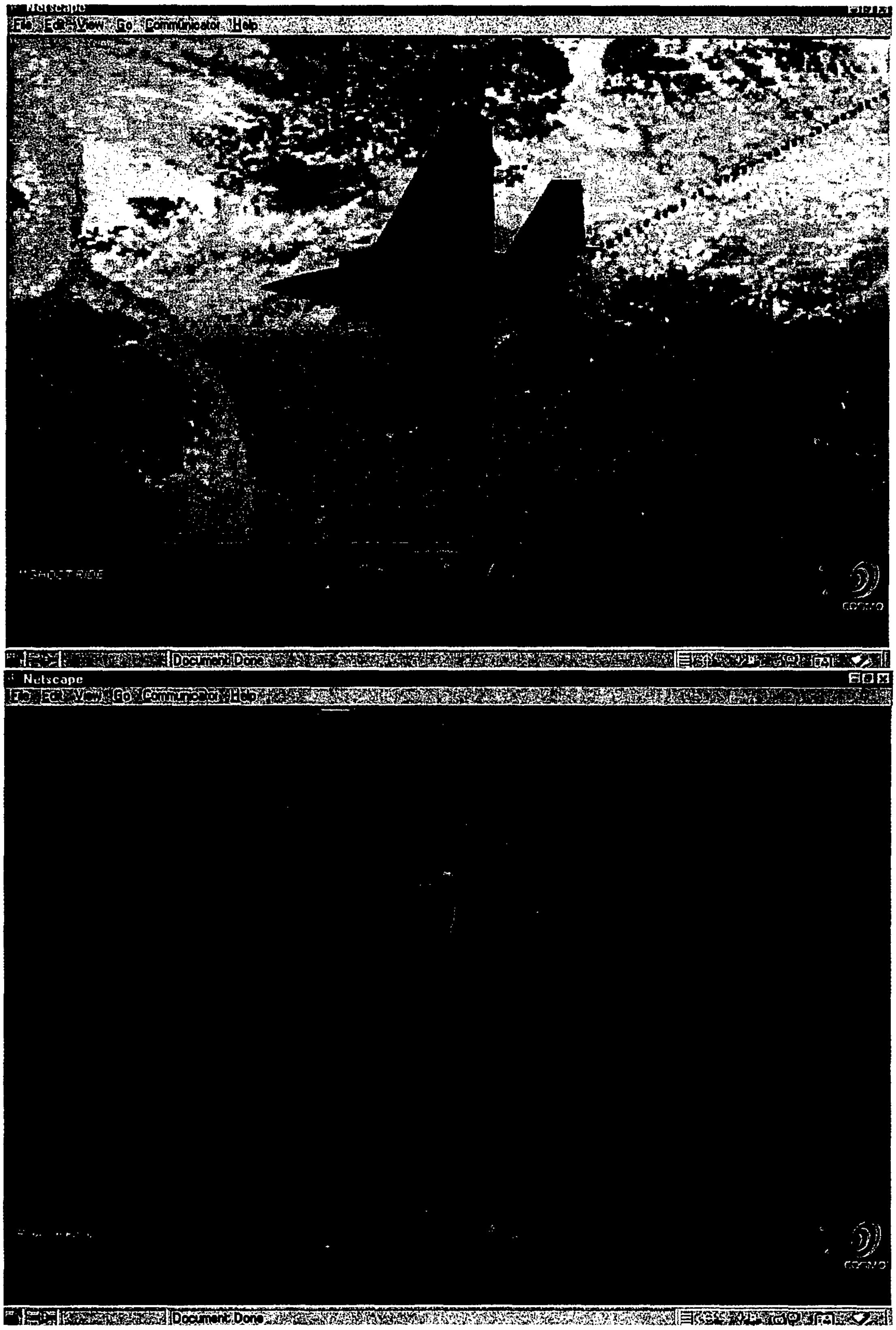
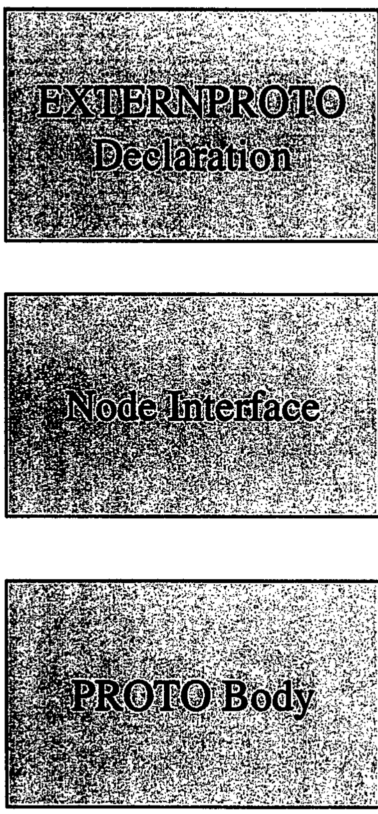


Figure 7.6. Two Different F-15 Level of Detail Models Provide by F-15 PROTO

E. TARGET PROTO

The Target PROTO is similar to Aircraft PROTO. Since the targets are not moving, they only need to be placed at a given location. The structure of the Target PROTO remains the same except that the HUD and the ROUTEs are not needed. Figure 7.6 illustrates the target PROTO.




```
EXTERNPROTO GeoLocation [
             field     SFNode      geoOrigin
             field     MFString    geoSystem
             field     SFString    geoCoords
             field     MFNode      children
             eventIn   SFString    set_geoCoords
             eventOut  SFString geoCoords_changed]
             ["GeoLocation.wrl" ]

PROTO Target [
          field     SFNode      geoOrigin  NULL
          field     MFString    geoSystem  ["UTM"]
          field     MFNode     TargetType [ ]
          field     SFString   CallSign "NoSign"
          field     SFString   TargetPosition[ ""]
{  # BEGIN Target PROTO

Group {
    children [
     DEF GeoPos  GeoLocation {
                    geoOrigin IS geoOrigin
                    geoSystem IS geoSystem
                    geoCoords IS TargetPosition
                    children  IS AircraftType}

             ]

      }
}#--END Target PROTO
```

Figure 7.7. Target PROTO

F. TERRAIN PROTO

The last major PROTO called by the virtual-battlespace air plan is the Terrain PROTO. This PROTO is composed of two sections in the main body. The first section

defines the GeoViewpoint nodes, which are used to demarcate absolute Viewpoints above and within the virtual battlespace. Unlike the viewpoints found in the F-15 PROTO, these GeoViewpoints remain fixed within the Geo Coordinate system and offers context to a specific location the virtual environment. Figure 7.8 and 7.9 presents four different GeoViewPoints.

The terrain's geometry encompasses the second section of the PROTO and is adapted from work done by the DIS-java-VRML working group. A set of Elevation Grids based on data collected on Fort Irwin terrain is the foundation of this geometry. The Elevation Grid is wrapped in a texture map of satellite imagery for the Fort Irwin terrain. The terrain is then georeferenced to the Fort Irwin coordinates within the virtual world. The effect is a contoured landscape that looks remarkably real and provides an excellent backdrop for low-flying missions.

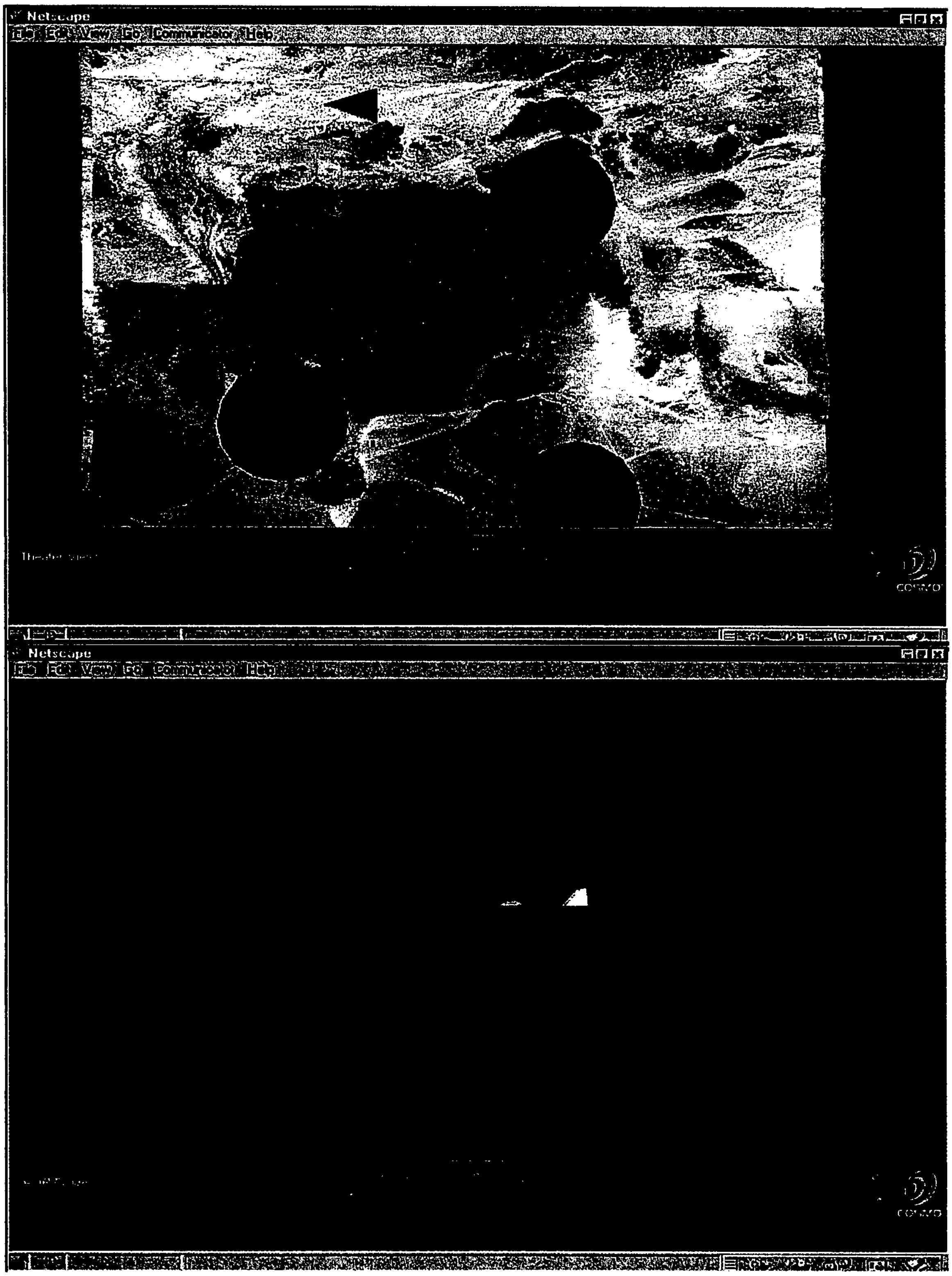


Figure 7.8. Two GeoReferenced Viewpoints.
Red Domes Indicate Target Footprints

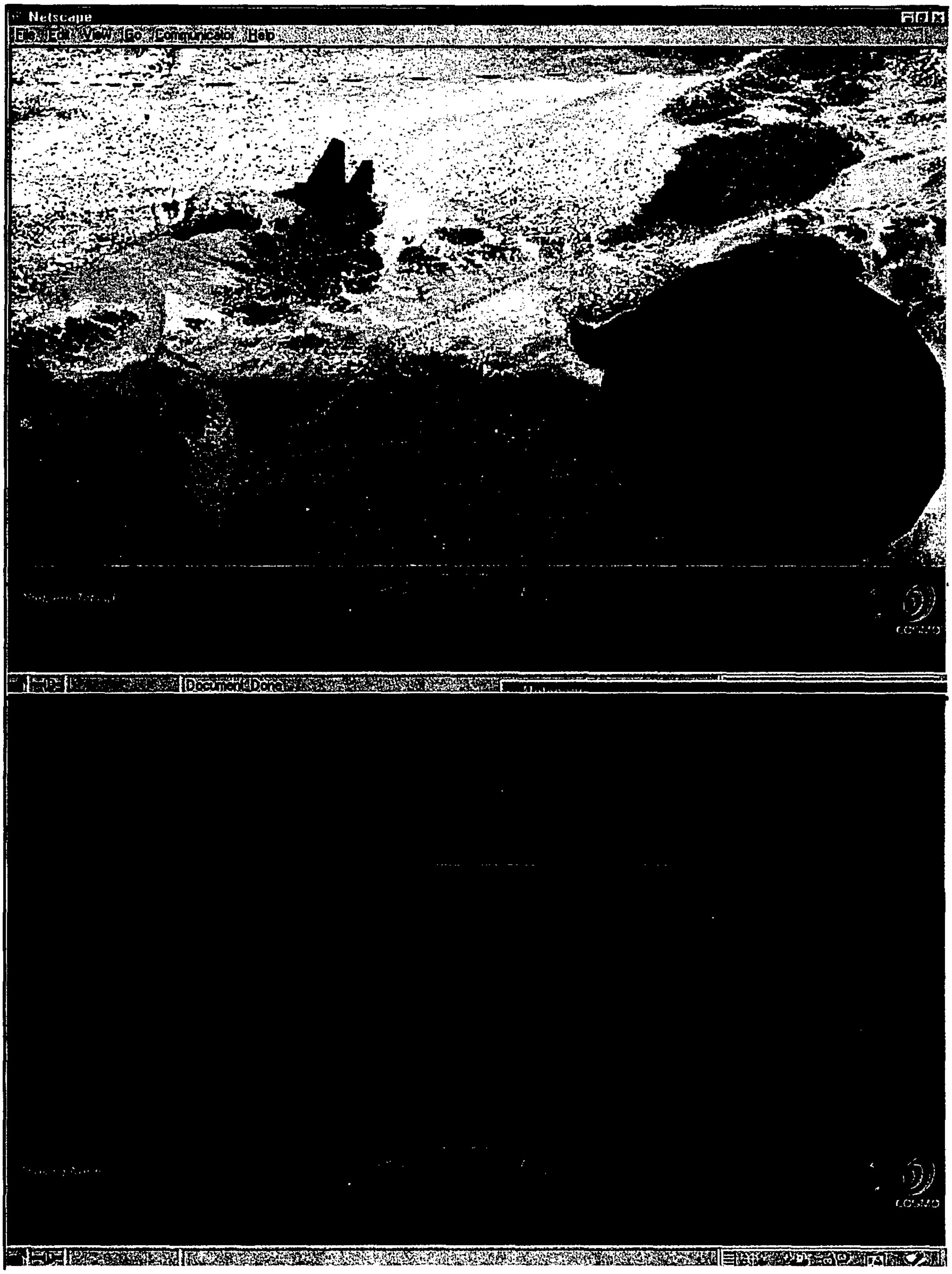


Figure 7.9. Two GeoViewpoints of the Battlespace

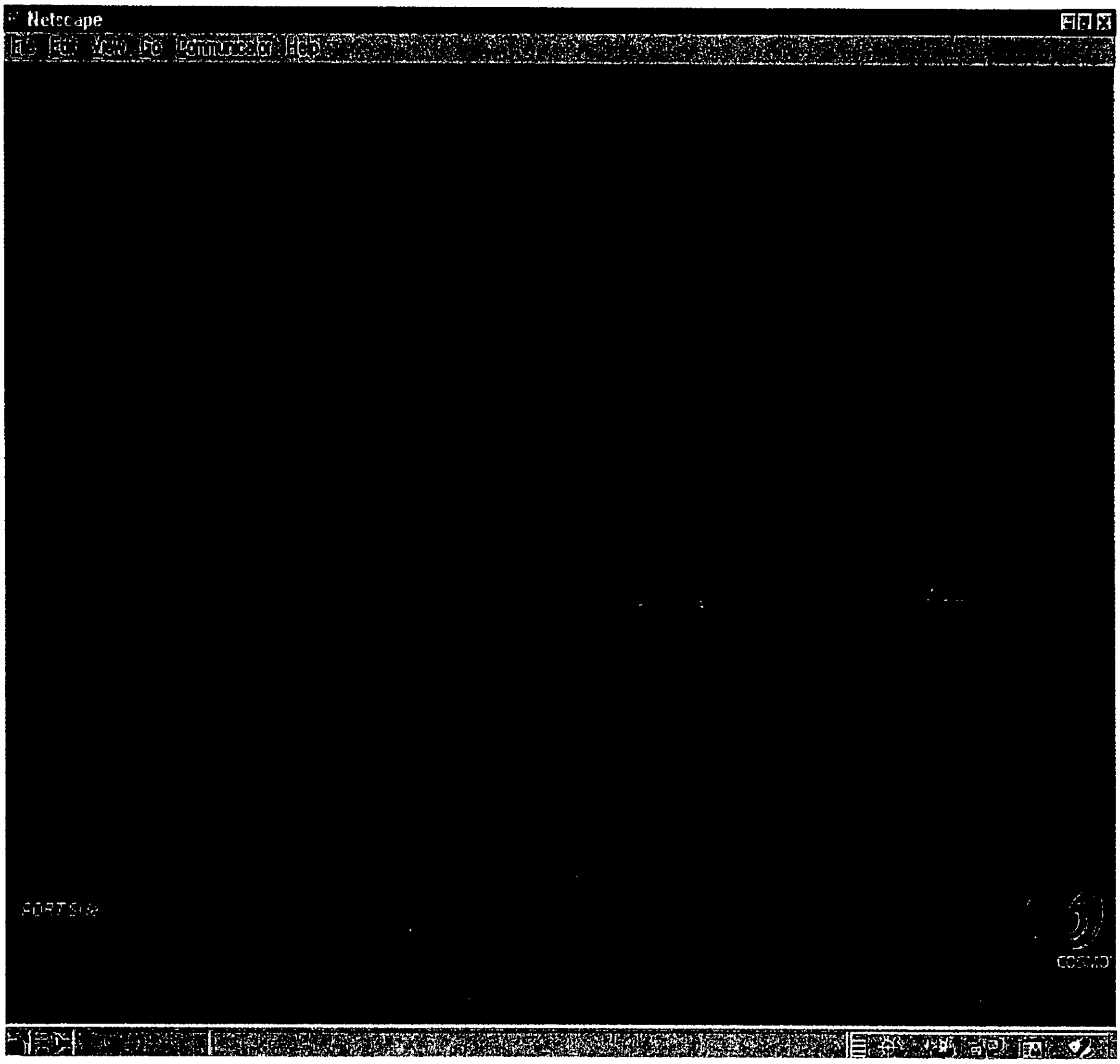


Figure 7.10 A Low Flying Apache Set Against Ft. Irwin Terrain

G. SUMMARY

This chapter describes how the virtual-battlespace air plan is implemented using VRML for animated 3D graphics. PROTOs allow the virtual air plan to remain uncomplicated and scalable, facilitating the autogeneration process. The three main PROTOs (Aircraft, Target, and Terrain) act both as a content-creation tool and as an interface between the virtual air plan and the detailed PROTO libraries. This modular

code structure allows for easy maintainabilty and reusablity. The XSL stylesheet generating the VRML code from the XML ATO is able to remain generic and only has to produce interface code for each aircraft and target. The end result is a visually appealling virtual-battlespace that can display the dynamic behavior of any permutation of an XML ATO.

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VIII. DEMONSTRATION RESULTS AND LIMITATIONS

A. INTRODUCTION

An air plan can be successfully rendered in a virtual world from an XML structured ATO. This chapter outlines the result of the ATO to virtual world proof of concept and states the results in qualitative terms. Additionally, limitations of the XML ATO model and virtual air plan PROTO suite are delineated in this chapter.

B. AIR TASKING ORDER MODEL RESULTS

The proof-of-concept ATO data conversion model created in XML is successfully implemented. This conclusion is based on the following:

1. Each XML document passes through the Saxon parser and the Microsoft XML parser.
2. Each XML document generated through a stylesheet transformation reflects the expected data results and formats.
3. The unit identification HTML file successfully finds all units specified within the ATO. Additionally, a similar stylesheet can be successfully applied to a well-formed (though not formally valid) "real world" XML ATO from the Desert Storm Operation.
4. The VRML code produced from the Master Operation Document (MOD) successfully passes the Vorlon (http://www.trapezium.com/vorlon.html) VRML conformance and syntax checker.

C. XML MODEL LIMITATIONS

1. Air Tasking Order DTD Redundancies

The Air Tasking Order DTD developed by the XML-MTF Development Team is the basis for all data structures used within this thesis. This was done to remain in compliance with the XML-MTF standard. However, the XML-MTF Air Tasking Order DTD is highly redundant and goes against the XML goals of simplicity and human

readability. A prime example of this redundancy is route point positional data. As seen in Figure 8.1, there are 16 different ways to describe a single route point location. Such an approach is prone to errors.

Several improvements are immediately possible. All the geodetic latitude-longitude positions and Universal Transverse Mercator (UTM) coordinates can be combined into one type of detailed element. Algorithms already exist that translate between UTM and latitude-longitude positions. These algorithms can be implemented via stylesheets and eliminate nine of the redundancies.

Three more redundancies are eliminated if the `route_point_abbrev_georef` elements are deleted and a new element encompasses the data in both `route_point_georef_minutes` and `route_point_georef_centiminute`. Taking these steps reduces the number of elements describing a single route point by a factor of four.

Reduction of the ATO redundancies not only increases the simplicity and readability of the ATO's structure, it also reduces the size and developmental times of XSL stylesheets. In Figure 8.1, a stylesheet must be created with the ability to parse through the data in each of the 16 children listed. What is not shown in Figure 8.1 is that 14 of the 16 children have numerous children of their own and the stylesheet must accommodate those elements as well. For example, if a fuel consumption calculation is desired, the stylesheet needs to accommodate every route point type and becomes unwieldy. Such efficiencies reduce document size, avoid numerous error modes, and also improve processing time, compression and transmission times.

```
<!ELEMENT route_point_route (
route_point_name |
route_point_lat_long_degrees |
route_point_lat_long_minutes |
route_point_lat_long_seconds |
route_point_verified_lat_long_degrees |
route_point_verified_lat_long_minutes |
route_point_verified_lat_long_seconds |
route_point_utm_1000_meter |
route_point_utm_100_meter |
route_point_utm_10_meter |
route_point_utm_1_meter |
route_point_georef_minute |
route_point_georef_centiminute |
route_point_abbrev_georef_minutes |
route_point_abbrev_georef_centiminute |
route_point_bearing_distance_from_ref_pt_expanded |
icao_base_code
  )? >
```

Figure 8.1. Example of ATO DTD Redundancies in Current Version of XML-MTF

2. Simplified Air Tasking Order (SATO) DTD Structure

The simplified ATO (SATO) DTD used in this thesis is not all encompassing. The SATO DTD is only capable of handling and transforming data describing air attack missions. No support missions, such as air-to-air refueling, are supported. This was a conscious decision made to reduce the complexity of ATO data and the complexity of the virtual world. Nevertheless it is a fully representative example demonstrating all necessary aspects of the XML/XSL/VRML methodology presented here.

3. W3C XML Specification Draft Status

Currently the XML specification is well developed and robust; however, related parts of the specification are still in draft form and many pieces are still being designed

(e.g. XLinks). Additionally, no web browser is 100% compliant with the completed portions of the XML specification. As a result, these two deficiencies pose limitations on the design of the demonstration. For example, the initial design of the XML model called for users to navigate through the entire demonstration within a browser environment. Instead, an awkward command line environment is employed for one-time ATO conversion.

4. Waypoint Arrival Times

In order to move aircraft around a virtual world, both waypoint locations and waypoint arrival times must be transferred from the Master Operational Document (MOD) to the VRML source code. Since waypoint data is outside the scope of the XML-MTF Air Tasking Order DTD, this thesis creates a single data structure that is simple to manipulate. In this thesis, the choice of temporal units of data structure for waypoint arrival times is cumulative seconds from the start time of the ATO. This decision is based on the virtual air plan's need for a cumulative measure of time normalized between zero and one. Other variations are possible but reliable consistency remains paramount.

For clarity, an example of normalized cumulative time follows. If a plane is scheduled to takeoff one hour after the effective start time of the ATO and the ATO is 24 hours long (or 86,400 seconds long), then the takeoff time is 0.041666667 ([1 hr * 60 minutes/hr * 60 seconds/minute] / 86,400 seconds).

In retrospect, a better representation might be to annotate times in terms of months, days, hours, minutes, seconds, and time zone. This structure has greater flexibility and can be converted into normalized times. To do so, a set of XSL variables can be created to compute the effective start time of the ATO and the total time of the

ATO. The cumulative time for each waypoint is calculated from the ATO's start time and then normalized based on the total time of the ATO. The normalized time can then be passed onto the VRML code by a stylesheet. Sophisticated yet straightforward arithmetic and logic programming examples can be found in the Instant Saxon documentation (Kay, 2000) and the *XSLT Programmer's Reference* (Kay, 2000).

D. VRML MODEL RESULTS

The Virtual Reality Modeling Language and the GeoVRML set of PROTOs provide a capable methodology for building virtual environments using compact autogenerated code. The VRML air-plan PROTO suite successfully displays multiple variations of the autogenerated virtual air plan. Each object designated in the XML ATO is correctly rendered and georeferenced. Additionally the virtual aircraft successfully fly between all given waypoints and maintain individual contextual information.

E. VRML LEARNING CURVE

The basic concepts of the Virtual Reality Modeling Language can be learned in approximately 10 weeks. Nevertheless, becoming efficient at developing user-friendly virtual environments can take several months of (often trial-and-error) coding practice. A substantial amount of time is spent on engineering the user interface to provide the meaningful viewpoints and useful user interactions.

Although on the surface VRML looks like any other programming language, it is considerably different. The concept of developing scene graph content, rather than program code, is a significant paradigm shift and there are many conceptual insights to

attain. For instance, the interface used to pass variables to PROTO nodes is clumsy and the movement of data via ROUTEs can be awkward. Nevertheless, a primary advantage of VRML is that scene graph content is not plagued by code-maintenance and platform portability problems like other programming languages.

F. VRML MODEL LIMITATIONS

The major limitation to the air plan PROTO suite is that the XSL stylesheet must contain an EXTERNPROTO reference to all aircraft and target models that need to be rendered. It is preferable that autogenerated code remains flexible enough to take advantage of future model updates, only being changed when major modifications are made to the interfaces of the three main PROTOs. Currently, the model cannot handle aircraft and targets that are not predefined in the stylesheet. Model libraries are an important area for future work.

Although the PROTO library limits the allowed number of aircraft and target model definitions, new model definitions are straightforward to add. If the VRML code defining a model's structure is previously generated, the air plan PROTO library can be updated within a couple of hours. If the model is not readily available, then it takes one to seven days, based on the level of detail desired, to construct a structural model. Target models that simulate physical attributes (such as a radar's probability of detection) can take up to several weeks (or months) to fully develop. Integration of 3D renderings with physically-based models and interactive network protocols remains the objective in most cases.

G. SUMMARY

This chapter reviews the results of the ATO to virtual world proof of concept. The XML ATO and VRML air plan models successfully render a 3D virtual air plan and have the potential to be scaled to a "real world" ATO. However, many limitations exist within the ATO and VRML air plan models. Most notably, the XML specification is still in a draft status. Consequently, many XML features, such as XSchema and XLink, are either not fully developed or not supported by commercially available XML products. The current structure of the SATO does not satisfy all the tasks specified in the ATO (i.e., Tomahawk missions and reconnaissance missions). Additionally, many redundancies contained in the XML-MTF ATO provide a laborious atmosphere that will hinder further development of a virtual battlespace for the rendering of a complete ATO. The VRML model is limited to aircraft found in the predefined libraries. Developing virtual worlds with VRML is straightforward to learn but takes a significant amount of time and practice to become proficient at building meaningful interfaces.

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IX. CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER WORK

A. CONCLUSION

The automatic transformation of an Air Tasking Order (ATO) into a 3D virtual world capable of displaying air attack missions is possible. Using the power of XML as the backbone of the ATO's data structures, an ATO can easily be manipulated, transformed, modularized, and reconstituted into other documents. Additionally, XML's formatting capabilities easily allow the creation of VRML source code. The Virtual Reality Model Language and the new GeoVRML Recommended Practice, provide a convenient environment to author, deploy and render such 3D virtual worlds.

B. RECOMMENDATIONS FOR FUTURE WORK

1. Reduction of Redundancies in the Air Tasking Order DTD

The XML-MTF Development team has developed a software tool that auto-generates DTDs for USMTF messages. While this is a useful technique which may work well for small and simple messages, it does pose some problems when dealing with long and complex messages like the ATO. Autogeneration of DTD design carries over many redundancies that have grown through the long history of the USMTF format. The end result is a complex DTD design that is neither simple to use nor human readable.

It is recommended that a small team of people knowledgeable in both the tactical needs of message consumers and the engineering of DTD design are brought together to further simplify the draft XML-MTF/ATO message standard and create a simpler DTD tagset for the ATO.

Not only will the ATO DTD be simpler and man readable, but the XSL stylesheets designed to transform data in an ATO will also become easier to design, test, implement and maintain. Significant reductions in file storage, computational costs and network bandwidth will result. A simpler ATO will result in lower developmental costs and more reliable use. Additionally, a clearer data structure will cause other messages, such as the Air Control Order and the Air Tasking Order Confirmation message, to be more straightforward and less costly to process.

2. Review Of XML-MTF Development Team's Goals

The ATO's redundancy problems discussed in the previous section may be related to partial completion of the first three goals of the XML-MTF Developmental Team:

> 1. "XML-MTF shall be easy to read, use, and understand. Descriptive names and logical structures that resemble as much as possible the structure of MTF standards shall be favored over terse abbreviations and clever shortcuts."
>
> 2. "XML-MTF shall be designed to ensure widespread military adoption. In keeping with this principle, XML-MTF shall be designed to accommodate current MTF standards."
>
> 3. "XML-MTF documents should be easy to construct from basic rules mapping it to MTF formats. Transformation of XML-MTF to formats such as USMTF, AdatP-3, and OTH-T Gold should be as simple as possible." (XML Development Team, 2000, pg. 1)

As described in the goals above, the MTF formats drive the structure of XML formatted messages. While this type of path maintains status quo within the USMTF community, it holds back the power of XML. Existing redundancies and ambiguities need not be preserved when unambiguous streamlining and optimization are possible.

A typical mistake when facing new technology is to force that technology to adapt to the old organizational processes. Instead, new technology can be used to revolutionize an organization's processes. It is time to not only reevaluate the XML-MTF goals, but to reevaluate the USMTF format. Expert optimization of the autogenerated tagset can yield significant messaging improvements. Joint review of USMTF functionality may produce the flexibility needed for significant organizational improvements.

3. XML Coordination within the Department of Defense

Structuring message data using XML has the power to be the Department of Defense's answer to system interoperability. However, this can only be achieved through a coordinated effort. If multiple system program offices embrace XML without coordinating their activities (namely the tagset data structures and element naming), with other programs in the DOD, then their XML efforts will be in vain. Uncoordinated XML efforts will only produce incompatible "stovepipes."

Already, XML stovepipes are beginning to occur. During research for this thesis, it was found that the USAF 46th Test Squadron (46th TS) is developing an XML model that applies to air mission planning systems. However, the 46th TS was unaware of work done by the XML-MTF Development Team. This is an unfortunate waste of resources because any mission planning system must be compliant with the message standards for the ATO.

To avoid future interoperability conflicts and minimize changes in XML data models, the DOD needs to take action. The DOD needs to set an acquisition policy for XML development and charge one organization to coordinate DOD-wide XML policy.

4. Develop Air Support Missions

In order for the XML/VRML model produced in this thesis to support all aspects of an ATO, further work must be done to implement the additional varieties of air-support missions within the model. As briefly discussed in section B.1 of Chapter 8, air support missions are purposely left out to reduce the complexity of the ATO and the virtual battlespace.

5. Implement An Airspace Control Order Within The Model

Aside from the ATO, a key component of theatre air planning is the Airspace Control Order (ACO). The ACO primarily defines what airspace is allocated to friendly aircraft. Any aircraft that wanders outside the edges of friendly aircraft airspace runs the risk of being a victim of fratricide. The geometric shapes of an ACO can be transposed on top of the ATO model created in this thesis. Fortunately, the XML-MTF Development Team has autogenerated a draft DTD for the ACO from the ACO's USMTF standard. This will significantly reduce the developmental time to implement an ATO/ACO model. With a combined ATO/ACO model, air planners can identify whether their missions obey the defined corridors of the ACO. The use of 3D visualization and intersection-detection techniques may improve deconfliction and reduce airspace assignment hazards.

6. Implement Simulation Capabilities and "What if?" Analysis

Currently, the virtual-battlespace air plan merely replicates a 3D version of the ATO. It is advantageous for air planners to run simulations. The virtual air plan can be converted to a simulator by adapting the PROTO libraries to include features of time-driven interactive simulation. Aspects of simulation that can be added include adding

probability distributions for mission success rate and realistic RADAR signatures that determine probability of detection. Including such a "what if?" analysis tool can allow air planners to reshape the virtual battlespace by dynamically diverting aircraft from their flight paths, selectively removing targets, and other high-level tasks that are easily confused using the massive amount of unconnected 2D data currently in use.

7. Adapt the Air Plan PROTOs to the Global Command and Control System (GCCS)

The Global Command and Control System (GCCS) uses live track information to support C4I systems. The XML ATO to Virtual Air Plan process and code can be modified to implement a virtual world application within GCCS operational environment. The underlying structure to support the transformation already exists because the GCCS system uses an Oracle database, which is XML enabled. Addition of 3D capabilities to new hardware imposes minimal cost because VRML browsing software is freely available and all new computers include 3D-graphics hardware acceleration.

8. Develop Dynamic Terrain for the Virtual World

The current model is able to locate an XML ATO to anywhere in the world, but is only able to display terrain over one specific location. Dynamic terrain is needed to provide crucial environmental visualization that is vital to air planning. Understanding the air plan requires accurate terrain models to be displayed with meaningful viewpoints. Ongoing work using the Extensible 3D (X3D) graphics standard, which encodes VRML in XML, will provide big payoffs in integrating these core technologies.

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APPENDIX A. ABBREVIATIONS

AADC	Area Air Defense Commander
ACA	Airspace Control Authority
ACO	Air Control Order
ACP	Airspace Control Plan
AFMSS	Air Force Mission Support System
ATO	Air Tasking Order
AWACS	Airborne Warning And Control System
BDA	Battle Damage Assessment
CINC	Commander-In-Chief
COTS	Commercial-Off-The-Shelf
CTAPS	Contingency Theater Automated Planning System
DISA	Defense Information Systems Agency
DOD	Department of Defense
DTD	Document Type Definition
HTML	Hypertext Markup Language
HUD	Heads-Up Display
JAOC	Joint Air Operations Center
JFACC	Joint Force Air Component Commander
JFC	Joint Force Commander
JIPTL	Joint Integrated Prioritized Target List
JMPS	Joint Mission Planning System
JSTARS	Joint Surveillance, Target Attack Radar System
MAAP	Master Air Attack Plan
MOD	Master Operational Document
MPS	Mission Planning System
MTF	Message Text Format
SATO	Simplified Air Tasking Order
SGML	Standard Generalized Markup Language
TAMPS	Tactical Aircraft Mission Planning System
TBMCS	Theater Battle Management Core System
U.S.	United States
URI	Uniform Resource Indicator
URL	Uniform Resource Locator
USMTF	United States Message Text Format
UTM	Universal Transverse Mercator
VRML	Virtual Reality Modeling Language
W3C	World Wide Web Consortium
X3D	Extensible 3D
XML	Extensible Markup Language
XML-MTF	Extensible Markup Language - Message Text Format
XSL	Extensible Style Language

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APPENDIX B. AIR TASKING ORDER DOCUMENT TYPE DEFINITION TABLE

```
<!-- Document Type Definition (DTD) for air_tasking_order.  This DTD is an abridged
     version of the real Air Tasking Order (ATO) DTD created by the XML-MTF
     Development Team.  This DTD was shortened because it is impossible to ensure
     that our simulated ATO would meet the requirements of the real ATO DTD every
     required data field in a our simulated ATO would have data.  A real ATO's data
     is produced by multi-million dollar systems (Contingency Tactical Air Planning
     System [CTAPS] and Tactical Battle Management Core System [TBMCS]) which are
     designed to produce valid ATO documents.

     This DTD will be the bases for the creation of the unit_air_attack_plan DTD and
     XML document, as well as the ato_header_data DTD and XML document.  An Air
     Tasking Order (ATO) will be created in XML and then parsed using an XSL Stylesheet
     to create XML air attack plans for units tasked in the ATO.

     This DTD has been separated into two sections. The first section defines children elements
     with only one parent.  The second section defines elements that are children with multiple
     parent elements.  To refine section 2 further, section 2 will be subdivided into geographic
     location elements and time/date elements.-->


<!-- xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx -->
<!-- Section 1 of DTD   Children elements with one parent -->
<!-- xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx -->

<!ELEMENT air_tasking_order (operation_identification_data?, exercise_identification?, message_identification?,
effective_day_time_frame, as_of_date_time_group, tasked_country_segment+)>

   <!-- xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx -->
   <!-- The following elements will be mapped to the ato_header_data -->
   <!-- xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx -->

   <!ELEMENT operation_identification_data (operation_codeword, plan_originator_and_number?, option_nickname?,
   secondary_option_nickname?)>
      <!ELEMENT operation_codeword (#PCDATA)>
      <!ELEMENT plan_originator_and_number (#PCDATA)>
      <!ELEMENT option_nickname (#PCDATA)>
      <!ELEMENT secondary_option_nickname (#PCDATA)>
   <!ELEMENT exercise_identification (exercise_nickname, exercise_message_additional_identifier?)>
```

```
   <!ELEMENT exercise_nickname (#PCDATA)>
   <!ELEMENT exercise_message_additional_identifier (#PCDATA)>
<!ELEMENT message_identification (message_text_format_identifier, originator, message_serial_number,
  month_name?,
qualifier?, serial_number_of_qualifier?)>
   <!ELEMENT message_text_format_identifier (#PCDATA)>
   <!ELEMENT originator (#PCDATA)>
   <!ELEMENT message_serial_number (#PCDATA)>
   <!-- month_name is defined in section 2, Time/Date elements -->
   <!ELEMENT qualifier (#PCDATA)>
   <!ELEMENT serial_number_of_qualifier (#PCDATA)>
<!ELEMENT effective_day_time_frame (beginning_date_time_group, ending_date_time_group,
  as_of_date_time_group?)>
   <!ELEMENT beginning_date_time_group (day, hour_time, minute_time, time_zone, month_name, year)>
      <!-- all children are defined in section 2, Time/Date elements -->
   <!ELEMENT ending_date_time_group (day, hour_time, minute_time, time_zone, month_name, year)>
      <!-- all children are defined in section 2, Time/Date elements -->
   <!ELEMENT as_of_date_time_group (day, hour_time, minute_time, time_zone, month_name, year)>
      <!-- all children are defined in section 2, Time/Date elements -->


<!-- xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx -->
<!-- The following elements will be mapped to the unit_air_attack_plan -->
<!-- xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx -->

<!ELEMENT tasked_country_segment (tasked_country, service_tasked_segment+)>
   <!ELEMENT tasked_country (country_of_the_world)>
      <!ELEMENT country_of_the_world (#PCDATA)>
   <!ELEMENT service_tasked_segment (service_tasked, task_unit_and_location_segment+)>
      <!ELEMENT service_tasked (tasked_service)>
         <!ELEMENT tasked_service (#PCDATA)>
      <!ELEMENT task_unit_and_location_segment (tasked_unit_and_location, aircraft_mission_data_segment+)>
         <!ELEMENT tasked_unit_and_location (tasked_unit_designator, tasked_unit_location_taskunit?) >
            <!ELEMENT tasked_unit_designator (#PCDATA)>
            <!ELEMENT tasked_unit_location_taskunit (icao_base_name | place_name |
            geographic_location_lat_long_minutes) >
               <!-- icao_base_name defined in section 2, Geographic location elements, Other location elements
               -->
               <!-- place_name defined in section 2, Geographic location elements, Other location elements -->
               <!ELEMENT geographic_location_lat_long_minutes (latitude_degrees, latitudinal_hemisphere,
```

```
    longitude_degrees, longitudinal_hemisphere, latitude_minute_angular, longitude_minute_angular)
    >
      <!-- all children are defined in section 2, Geographic location elements, Latitude/Longitude
          location elements -->
<!ELEMENT aircraft_mission_data_segment (individual_aircraft_mission_data+, aircraft_mission_data,
aircraft_mission_location_segment+)>
  <!ELEMENT individual_aircraft_mission_data_segment (individual_aircraft_mission_data) >
    <!ELEMENT individual_aircraft_mission_data (number_of_aircraft, type_of_aircraft,
     aircraft_call_sign, primary_configuration_code, secondary_configuration_code) >
      <!ELEMENT number_of_aircraft (#PCDATA)>
      <!ELEMENT type_of_aircraft (aircraft_type_and_model | aircraft_type_and_model_other)>
        <!ELEMENT aircraft_type_and_model (#PCDATA)>
        <!ELEMENT aircraft_type_and_model_other (#PCDATA)>
      <!ELEMENT aircraft_call_sign (#PCDATA)>
      <!ELEMENT primary_configuration_code (#PCDATA)>
      <!ELEMENT secondary_configuration.code (#PCDATA)>
  <!ELEMENT aircraft_mission_data (mission_number, primary_mission_type, secondary_mission_type)>
    <!ELEMENT mission_number (#PCDATA)>
    <!ELEMENT primary_mission_type (#PCDATA)>
    <!ELEMENT secondary_mission_type (#PCDATA)>
  <!ELEMENT aircraft_mission_location_segment (ground_target_location?)>
    <!ELEMENT ground_target_location (target_type, target_priority?, time_on_target_gtgtloc,
     desired_mean_point_of_impact_gtgtloc) >
    <!ELEMENT target_type (#PCDATA)>
      <!ELEMENT target_priority (#PCDATA)>
      <!ELEMENT time_on_target_gtgtloc (day_time_and_month_tasked_on_target |
          day_time_on_target_to_the_second) >
        <!ELEMENT day_time_and_month_tasked_on_target (day, hour_time, minute_time, time_zone,
        month_name) >
          <!-- all children are defined in section 2, Time/Date elements -->
        <!ELEMENT day_time_on_target_to_the_second (day, hour_time, minute_time, second_time,
        time_zone_zulu) >
          <!-- all children are defined in section 2, Time/Date elements -->
      <!ELEMENT desired_mean_point_of_impact_gtgtloc (dmpi_lat_long_minutes |
      dmpi_lat_long_seconds |  dmpi_lat_long_deciseconds | dmpi_lat_long_centiseconds |
      dmpi_lat_long_thousandths_of_minute |  dmpi_lat_long_ten_thousandths_of_minute) >
      <!ELEMENT dmpi_lat_long_minutes (latitude_degrees, latitudinal_hemisphere,
      longitude_degrees, longitudinal_hemisphere, latitude_minute_angular,
      longitude_minute_angular) >
      <!-- all children are defined in section 2, Geographic location elements, Latitude/
      Longitude location elements -->
      <!ELEMENT dmpi_lat_long_seconds (latitude_degrees, latitudinal_hemisphere,
      longitude_degrees, longitudinal_hemisphere, latitude_minute_angular,
      longitude_minute_angular, latitude_seconds_angular, longitude_seconds_angular) >
```

```
<!-- all children are defined in section 2, Geographic location elements,
Latitude/Longitude location elements -->
<!ELEMENT dmpi_lat_long_deciseconds (latitude_degrees, latitudinal_hemisphere,
longitude_degrees, longitudinal_hemisphere, latitude_minute_angular,
longitude_minute_angular, latitude_deciseconds_angular, longitude_deciseconds_angular) >
<!-- all children are defined in section 2, Geographic location elements,
Latitude/Longitude location elements -->
<!ELEMENT dmpi_lat_long_centiseconds (latitude_degrees, latitudinal_hemisphere,
longitude_degrees, longitudinal_hemisphere, latitude_minute_angular,
longitude_minute_angular, latitude_centiseconds_angular, longitude_centiseconds_angular) >
<!-- all children are defined in section 2, Geographic location elements,
Latitude/Longitude location elements -->
<!ELEMENT dmpi_lat_long_thousandths_of_minute (latitude_degrees, latitude_minute_angular,
decimal, thousandth_of_minute_of_latitude, latitudinal_hemisphere, longitude_degrees,
longitude_minute_angular, decimal, thousandth_of_minute_of_longitude,
longitudinal_hemisphere) >
<!-- all children are defined in section 2, Geographic location elements,
Latitude/Longitude location elements -->
<!ELEMENT dmpi_lat_long_ten_thousandths_of_minute (latitude_degrees,
latitude_minute_angular, decimal, ten_thousandth_of_minute_of_latitude,
latitudinal_hemisphere, longitude_degrees, longitude_minute_angular, decimal,
ten_thousandth_of_minute_of_longitude, longitudinal_hemisphere) >
<!-- all children are defined in section 2, Geographic location elements, Latitude/Longitude
     location elements -->


<!ELEMENT dmpi_utm_1_meter (utm_grid_zone_designation, utm_grid_zone_hemisphere,
utm_grid_zone_row, utm_100000_meter_square_row, utm_1_meter_northing, utm_grid_zone_column,
utm_100000_meter_square_column, utm_1_meter_easting) >
<!-- all children are defined in section 2, Geographic location elements, UTM location
elements -->

<!--  Section 2 of DTD   Children elments with multiple parents -->

   <!-- Geographic location elements -->

      <!-- Latitude/Longitude location elements -->

         <!ELEMENT latitude_degrees (#PCDATA)>
         <!ELEMENT latitudinal_hemisphere (#PCDATA)>
         <!ELEMENT longitude_degrees (#PCDATA)>
         <!ELEMENT longitudinal_hemisphere (#PCDATA)>
         <!ELEMENT latitude_minute_angular (#PCDATA)>
```

```
   <!ELEMENT longitude_minute_angular (#PCDATA)>
   <!ELEMENT latitude_seconds_angular (#PCDATA)>
   <!ELEMENT longitude_seconds_angular (#PCDATA)>
   <!ELEMENT latitude_deciseconds_angular (#PCDATA)>
   <!ELEMENT longitude_deciseconds_angular (#PCDATA)>
   <!ELEMENT latitude_centiseconds_angular (#PCDATA)>
   <!ELEMENT longitude_centiseconds_angular (#PCDATA)>
   <!ELEMENT decimal (#PCDATA)>
   <!ELEMENT thousandth_of_minute_of_latitude (#PCDATA)>
   <!ELEMENT thousandth_of_minute_of_longitude (#PCDATA)>
   <!ELEMENT ten_thousandth_of_minute_of_latitude (#PCDATA)>
   <!ELEMENT ten_thousandth_of_minute_of_longitude (#PCDATA)>

<!-- UTM location elements -->

   <!ELEMENT utm_grid_zone_designation (#PCDATA)>
   <!ELEMENT utm_grid_zone_hemisphere (#PCDATA)>
   <!ELEMENT utm_grid_zone_row (#PCDATA)>
   <!ELEMENT utm_100000_meter_square_row (#PCDATA)>
   <!ELEMENT utm_1000_meter_northing (#PCDATA)>
   <!ELEMENT utm_100_meter_northing (#PCDATA)>
   <!ELEMENT utm_10_meter_northing (#PCDATA)>
   <!ELEMENT utm_1_meter_northing (#PCDATA)>
   <!ELEMENT utm_grid_zone_column (#PCDATA)>
   <!ELEMENT utm_100000_meter_square_column (#PCDATA)>
   <!ELEMENT utm_1000_meter_easting (#PCDATA)>
   <!ELEMENT utm_100_meter_easting (#PCDATA)>
   <!ELEMENT utm_10_meter_easting (#PCDATA)>
   <!ELEMENT utm_1_meter_easting (#PCDATA)>

<!-- Georeference location elements -->

   <!ELEMENT fifteen_degree_quadrilateral_georef (#PCDATA)>
   <!ELEMENT one_degree_quadrilateral_georef (#PCDATA)>
   <!ELEMENT minute_easting_georef (#PCDATA)>
   <!ELEMENT minute_northing_georef (#PCDATA)>
   <!ELEMENT centiminute_angular_easting (#PCDATA)>
   <!ELEMENT centiminute_angular_northing (#PCDATA)>

<!-- Other location elements -->

   <!ELEMENT icao_base_name (#PCDATA)>
   <!ELEMENT place_name (#PCDATA)>
```

```
<!-- Time/date elements -->

      <!ELEMENT day (#PCDATA)>
      <!ELEMENT hour_time (#PCDATA)>
      <!ELEMENT minute_time (#PCDATA)>
      <!ELEMENT second_time (#PCDATA)>
      <!ELEMENT time_zone_zulu (#PCDATA)>
      <!ELEMENT time_zone (#PCDATA)>
      <!ELEMENT month_name (#PCDATA)>
      <!ELEMENT year (#PCDATA)>
```

APPENDIX C. AIR TASKING ORDER ROOT IN XML

```
<?xml version="1.0" standalone="no"?>

<?xml-stylesheet type="text/xsl" href="units_in_ato.xsl"?>
  <!-- The Above Stylesheet Identifies Units Tasked within the ATO.  The
          output is in the form of a HTML web page -->
<!-- <?xml-stylesheet type="text/xsl" href="ato_header_data.xsl"?> -->
  <!-- The Above Stylesheet creates an XML document containing the ATO's
          header information -->
<!-- <?xml-stylesheet type="text/xsl" href="100TFW_air_attack_plan.xsl"?> -->
  <!-- The Above Stylesheet creates an XML document containing XXX unit's
          unit_air_attack_plan information  -->
<!-- <?xml-stylesheet type="text/xsl" href="4TFW_air_attack_plan.xsl"?>  -->
  <!-- The Above Stylesheet creates an XML document containing XXX unit's
          unit_air_attack_plan information  -->
<!-- <?xml-stylesheet type="text/xsl" href="101AIRCAV_air_attack_plan.xsl"?> -->
  <!-- The Above Stylesheet creates an XML document containing XXX unit's
          unit_air_attack_plan information  -->


<!-- Air Tasking Order (ATO) XML ROOT document -->

<!DOCTYPE air_tasking_order_root [

  <!ELEMENT air_tasking_order_root (air_tasking_order)>

      <!ENTITY % ato_tasking_order_entity SYSTEM "air_tasking_order 16May2000.dtd">
  %ato_tasking_order_entity; <!-- External Parameter Entity Call for ATO
                                        DTD -->


   <!XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX-->
   <!-- External General Entity Call for ATO XML Data.  Only one of the three
        entity calls for data Is used at any one time.  The entity calls for
        data are at varying levels of ATO complexity -->
   <!-- XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX -->

<!-- <!ENTITY air_tasking_order_in_XML SYSTEM "air_tasking_order_in_XML.xml"> -->
<!-- <!ENTITY simple_air_tasking_order_in_XML SYSTEM "simple_air_tasking_order_in_XML.xml"> -->
<!ENTITY complex_air_tasking_order_in_XML SYSTEM "complex_air_tasking_order_in_XML.xml">
```

```
]>

<air_tasking_order_root>

<!-- &air_tasking_order_in_XML; -->
<!-- &simple_air_tasking_order_in_XML; -->
&complex_air_tasking_order_in_XML;

</air_tasking_order_root>
```

APPENDIX D. SIMPLE AIR TASKING ORDER IN XML

```xml
<!-- XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX -->
<!-- This is the XML data for the simple ATO.  This simple ATO tasks     four aircaft 1 Army helicopter from the
101AIRCAV unit and 3 F-15 jets from the USAF.  Two F-15s are assigned to the 4th Tactical Fighter Wing (4TFW) and
the other aircraft is assigned to the 101st Tactical Fighter Wing (101TFW).  The helicopter from the 101AIRCAV is
assigned the mission of destroying an enemy early warning aircraft.  The 2 jets from the 4TFW are tasked with
destroying SAM sites and the F-15 from the 100TFW's mission is to destroy and enemy airstrip. -->
<!-- XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX -->

<air_tasking_order>
   <operation_identification_data>
      <operation_codeword>THESIS SIMPLE ATO</operation_codeword>
   </operation_identification_data>
   <message_identification>
      <message_text_format_identifier>ATO</message_text_format_identifier>
      <originator>MURRAY-QUIGLEY</originator>
      <message_serial_number>0001</message_serial_number>
   </message_identification>
 <effective_day_time_frame>
    <beginning_date_time_group>
       <day>1</day>
         <hour_time>01</hour_time>
         <minute_time>00</minute_time>
         <time_zone>Z</time_zone>
         <month_name>JUNE</month_name>
         <year>2000</year>
      </beginning_date_time_group>
      <ending_date_time_group>
         <day>1</day>
         <hour_time>23</hour_time>
         <minute_time>59</minute_time>
         <time_zone>Z</time_zone>
         <month_name>JUNE</month_name>
         <year>2000</year>
      </ending_date_time_group>
   </effective_day_time_frame>
   <tasked_country_segment>
      <tasked_country>
         <country_of_the_world>USA</country_of_the_world>
      </tasked_country>
```

```
<service_tasked_segment>
     <service_tasked>
        <tasked_service>ARMY</tasked_service>
     </service_tasked>
     <task_unit_and_location_segment>
        <tasked_unit_and_location>
           <tasked_unit_designator>101AIRCAV</tasked_unit_designator>
           <tasked_unit_location_taskunit>
              <place_name>FT IRWIN HELO AIRSTRIP</place_name>
           </tasked_unit_location_taskunit>
        </tasked_unit_and_location>
        <aircraft_mission_data_segment>
           <individual_aircraft_mission_data_segment>
              <individual_aircraft_mission_data>
                 <number_of_aircraft>1</number_of_aircraft>
                 <type_of_aircraft>
                    <aircraft_type_and_model>APACHE</aircraft_type_and_model>
                 </type_of_aircraft>
                 <aircraft_call_sign>EARLYBIRD2</aircraft_call_sign>
                 <primary_configuration_code>HELLFIRE</primary_configuration_code>
              <secondary_configuration_code></secondary_configuration_code>
           </individual_aircraft_mission_data>
        </individual_aircraft_mission_data_segment>
           <aircraft_mission_data>
              <mission_number>EWRADAR02</mission_number>
              <primary_mission_type>INT</primary_mission_type>
              <secondary_mission_type></secondary_mission_type>
           </aircraft_mission_data>
           <aircraft_mission_location_segment>
              <ground_target_location>
                  <target_type>EARLY WARNING RADAR</target_type>
                  <target_priority>1D</target_priority>
                  <primary_aternate_designator></primary_aternate_designator>
                  <time_on_target_gtgtloc>
                     <day_time_on_target_to_the_second>
                        <day>1</day>
                        <hour_time>00</hour_time>
                        <minute_time>18</minute_time>
                        <second_time>11</second_time>
                        <time_zone_zulu>Z</time_zone_zulu>
                     </day_time_on_target_to_the_second>
                  </time_on_target_gtgtloc>
```

```
            <desired_mean_point_of_impact_gtgtloc>
               <dmpi_utm_1_meter>
                  <utm_grid_zone_designation>11</utm_grid_zone_designation>
                  <utm_grid_zone_hemisphere>N</utm_grid_zone_hemisphere>
                  <utm_grid_zone_row>39</utm_grid_zone_row>
                  <utm_100000_meter_square_row>23</utm_100000_meter_square_row>
                  <utm_1_meter_northing>500</utm_1_meter_northing>
                  <utm_grid_zone_column>5</utm_grid_zone_column>
                  <utm_100000_meter_square_column>36</utm_100000_meter_square_column>
                  <utm_1_meter_easting>500</utm_1_meter_easting>
               </dmpi_utm_1_meter>
            </desired_mean_point_of_impact_gtgtloc>
         </ground_target_location>
      </aircraft_mission_location_segment>
    </aircraft_mission_data_segment>
  </task_unit_and_location_segment>
</service_tasked_segment>
<service_tasked_segment>
  <service_tasked>
    <tasked_service>USAF</tasked_service>
</service_tasked>
<task_unit_and_location_segment>
  <tasked_unit_and_location>
     <tasked_unit_designator>100TFW</tasked_unit_designator>
     <tasked_unit_location_taskunit>
        <place_name>29 PALMS AIRSTRIP</place_name>
     </tasked_unit_location_taskunit>
   </tasked_unit_and_location>
   <aircraft_mission_data_segment>
      <individual_aircraft_mission_data_segment>
         <individual_aircraft_mission_data>
            <number_of_aircraft>1</number_of_aircraft>
            <type_of_aircraft>
               <aircraft_type_and_model>F15</aircraft_type_and_model>
            </type_of_aircraft>
            <aircraft_call_sign>THUNDER3</aircraft_call_sign>
            <primary_configuration_code>GBU10</primary_configuration_code>
            <secondary_configuration_code></secondary_configuration_code>
         </individual_aircraft_mission_data>
      </individual_aircraft_mission_data_segment>
      <aircraft_mission_data>
         <mission_number>AIRSTRIP03</mission_number>
```

```
      <primary_mission_type>INT</primary_mission_type>
      <secondary_mission_type></secondary_mission_type>
    </aircraft_mission_data>
    <aircraft_mission_location_segment>
      <ground_target_location>
         <target_type>AIRSTRIP</target_type>
         <target_priority>1D</target_priority>
         <primary_aternate_designator></primary_aternate_designator>
         <time_on_target_gtgtloc>
            <day_time_on_target_to_the_second>
               <day>1</day>
               <hour_time>00</hour_time>
               <minute_time>25</minute_time>
               <second_time>24</second_time>
               <time_zone_zulu>Z</time_zone_zulu>
            </day_time_on_target_to_the_second>
         </time_on_target_gtgtloc>
         <desired_mean_point_of_impact_gtgtloc>
            <dmpi_utm_1_meter>
               <utm_grid_zone_designation>11</utm_grid_zone_designation>
            <utm_grid_zone_hemisphere>N</utm_grid_zone_hemisphere>
            <utm_grid_zone_row>39</utm_grid_zone_row>
            <utm_100000_meter_square_row>42</utm_100000_meter_square_row>
               <utm_1_meter_northing>250</utm_1_meter_northing>
               <utm_grid_zone_column>5</utm_grid_zone_column>
               <utm_100000_meter_square_column>29</utm_100000_meter_square_column>
               <utm_1_meter_easting>850</utm_1_meter_easting>
            </dmpi_utm_1_meter>
         </desired_mean_point_of_impact_gtgtloc>
      </ground_target_location>
    </aircraft_mission_location_segment>
  </aircraft_mission_data_segment>
</task_unit_and_location_segment>

<task_unit_and_location_segment>
  <tasked_unit_and_location>
    <tasked_unit_designator>4TFW</tasked_unit_designator>
    <tasked_unit_location_taskunit>
      <place_name>29 PALMS AIRSTRIP</place_name>
    </tasked_unit_location_taskunit>
  </tasked_unit_and_location>
```

```
<aircraft_mission_data_segment>
   <individual_aircraft_mission_data_segment>
      <individual_aircraft_mission_data>
         <number_of_aircraft>1</number_of_aircraft>
         <type_of_aircraft>
            <aircraft_type_and_model>F15</aircraft_type_and_model>
         </type_of_aircraft>
         <aircraft_call_sign>UNCLESAM11</aircraft_call_sign>
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 </tasked_country_segment>
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APPENDIX E. COMPLEX AIR TASKING ORDER IN XML


```xml
<!-- XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX -->
<!-- This is the XML data for the simple ATO.  This simple ATO tasks four aircaft
     1 Army helicopter from the 101AIRCAV unit and 3 F-15 jets from the USAF.
     Two F-15s are assigned to the 4th Tactical Fighter Wing (4TFW) and the other
     aircraft is assigned to the 101st Tactical Fighter Wing (101TFW).  The
     helicopter from the 101AIRCAV is assigned the mission of destroying an
     enemy early warning aircraft.  The 2 jets from the 4TFW are tasked with
     destroying SAM sites and the F-15 from the 100TFW's mission is to destroy
     and enemy airstrip                                                        -->
<!-- XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX -->

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```xml
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             <aircraft_type_and_model>F15</aircraft_type_and_model>
          </type_of_aircraft>
          <aircraft_call_sign>UNCLESAM13</aircraft_call_sign>
          <primary_configuration_code>GBU10</primary_configuration_code>
          <secondary_configuration_code></secondary_configuration_code>
       </individual_aircraft_mission_data>
    </individual_aircraft_mission_data_segment>
 <aircraft_mission_data>
       <mission_number>SAM13</mission_number>
       <primary_mission_type>INT</primary_mission_type>
       <secondary_mission_type></secondary_mission_type>
    </aircraft_mission_data>
    <aircraft_mission_location_segment>
       <ground_target_location>
           <target_type>SAM SITE</target_type>
           <target_priority>1D</target_priority>
           <primary_aternate_designator></primary_aternate_designator>
           <time_on_target_gtgtloc>
              <day_time_on_target_to_the_second>
                 <day>1</day>
                 <hour_time>00</hour_time>
                 <minute_time>21</minute_time>
                 <second_time>43</second_time>
                 <time_zone_zulu>Z</time_zone_zulu>
              </day_time_on_target_to_the_second>
           </time_on_target_gtgtloc>
```

```
            <desired_mean_point_of_impact_gtgtloc>
               <dmpi_utm_1_meter>
                  <utm_grid_zone_designation>11</utm_grid_zone_designation>
                  <utm_grid_zone_hemisphere>N</utm_grid_zone_hemisphere>
                  <utm_grid_zone_row>39</utm_grid_zone_row>
                  <utm_100000_meter_square_row>25</utm_100000_meter_square_row>
                  <utm_1_meter_northing>350</utm_1_meter_northing>
                  <utm_grid_zone_column>5</utm_grid_zone_column>
                  <utm_100000_meter_square_column>28</utm_100000_meter_square_column>
                  <utm_1_meter_easting>600</utm_1_meter_easting>
               </dmpi_utm_1_meter>
            </desired_mean_point_of_impact_gtgtloc>
         </ground_target_location>
      </aircraft_mission_location_segment>
   </aircraft_mission_data_segment>

  </task_unit_and_location_segment>
 </service_tasked_segment>
</tasked_country_segment>

</air_tasking_order>
```

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APPENDIX F. UNIT IDENTIFIER XSL STYLESHEET

```
<?xml version="1.0"?>
<!--  <xsl:stylesheet xmlns:xsl="http://www.w3.org/TR/WD-xsl">  --> <!-- Microsoft reference call -->
<xsl:stylesheet xmlns:xsl="http://www.w3.org/1999/XSL/Transform" version="1.0">  <!-- SAXON reference call -->


<!-- XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX -->
<!-- This style sheet is used to identify units tasked within an Air Tasking Order (ATO).
     The style sheet will output the units in an HTML web page.  Style sheet users will be:
  1. Units assigned to a task force ==> units will use the style sheet to see if
                                         they are tasked in ATO
  2. Master Operational Document (MOD) care takers ==> care takers will identify
                                                        units tasked and modify the
                                                        MOD's general entity calls
                                                        for XML data for each unit

 -->
<!-- XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX -->


<xsl:template match="/">
  <html>
<xsl:apply-templates/>
  </html>
</xsl:template>

   <xsl:template match="air_tasking_order">
   <xsl:apply-templates/>
   </xsl:template>

      <xsl:template match="operation_identification_data"/>
      <xsl:template match="exercise_identification"/>
      <xsl:template match="message_identification"/>
       <xsl:template match="effective_day_time_frame"/>

   <xsl:template match="tasked_country_segment">
      <xsl:apply-templates/>
   </xsl:template>
```

```
<xsl:template match="tasked_country"/>

<xsl:template match="service_tasked_segment">
<xsl:apply-templates/>
</xsl:template>

   <xsl:template match="service_tasked"/>

   <xsl:template match="task_unit_and_location_segment">
      <xsl:apply-templates/>
   </xsl:template>

      <xsl:template match="tasked_unit_and_location">
         <xsl:apply-templates/>
      </xsl:template>

         <xsl:template match="tasked_unit_designator">
            <P>
               <xsl:value-of select="."/>
            </P>
      </xsl:template>
   <xsl:template match="tasked_unit_location_taskunit"/>

<xsl:template match="aircraft_mision_data_segment"/>
   <xsl:template match="individual_aircraft_mission_data_segment"/>
      <xsl:template match="individual_aircraft_mission_data"/>
      <xsl:template match="aircraft_mission_data"/>
      <xsl:template match="aircraft_mission_location_segment"/>
         <xsl:template match="ground_target_location"/>
            <xsl:template match="target_type"/>
            <xsl:template match="target_priority"/>
            <xsl:template match="time_on_target_gtgtloc"/>
            <xsl:template match="desired_mean_point_of_impact_gtgtloc"/>

</xsl:stylesheet>
```

APPENDIX G. UNITS IDENTIFIED IN HTML

```
<html>
   <P>101AIRCAV</P>
   <P>100TFW</P>
   <P>4TFW</P>
</html>
```

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APPENDIX H. AIR TASKING ORDER HEADER DATA DOCUMENT TYPE DEFINITION

```
<!-- Document Type Definition (DTD) for ato_header_data.  This DTD will be imported into
     the Master Operational Document (MOD) with the use of entities within the MOD.
-->

<!-- <!ELEMENT ato_header_data (operation_identification_data?, exercise_identification?, message_identification?,
effective_day_time_frame)> -->

   <!-- xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx -->
   <!-- The following elements are mapped from the air_tasking_order -->
   <!-- xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx -->

   <!ELEMENT operation_identification_data (operation_codeword, plan_originator_and_number?, option_nickname?,
     secondary_option_nickname?)>
      <!ELEMENT operation_codeword (#PCDATA)>
      <!ELEMENT plan_originator_and_number (#PCDATA)>
      <!ELEMENT option_nickname (#PCDATA)>
      <!ELEMENT secondary_option_nickname (#PCDATA)>
<!ELEMENT exercise_identification (exercise_nickname, exercise_message_additional_identifier?)>
    <!ELEMENT exercise_nickname (#PCDATA)>
    <!ELEMENT exercise_message_additional_identifier (#PCDATA)>
   <!ELEMENT message_identification (message_text_format_identifier, originator, message_serial_number,
     month_name?, qualifier?, serial_number_of_qualifier?)>
      <!ELEMENT message_text_format_identifier (#PCDATA)>
      <!ELEMENT originator (#PCDATA)>
      <!ELEMENT message_serial_number (#PCDATA)>
      <!-- month_name is defined in section 2, Time/Date elements -->
      <!ELEMENT qualifier (#PCDATA)>
      <!ELEMENT serial_number_of_qualifier (#PCDATA)>
   <!ELEMENT effective_day_time_frame (beginning_date_time_group, ending_date_time_group, as_of_date_time_group?)>
      <!ELEMENT beginning_date_time_group (day, hour_time, minute_time, time_zone, month_name, year)>
         <!-- all children are defined in the MOD from the imported DTD of unit_air_attack_plan -->
      <!ELEMENT ending_date_time_group (day, hour_time, minute_time, time_zone, month_name, year)>
         <!-- all children are defined in the MOD from the imported DTD of unit_air_attack_plan -->
```

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APPENDIX I. AIR TASKING ORDER HEADER DATA IN XML CREATED FROM THE AIR TASKING ORDER


```
<?xml version="1.0" encoding="utf-8" ?>


<ato_header_data>
   <operation_identification_data>
      <operation_codeword>THESIS SIMPLE ATO</operation_codeword>
   </operation_identification_data>
   <message_identification>
      <message_text_format_identifier>ATO</message_text_format_identifier>
      <originator>MURRAY-QUIGLEY</originator>
      <message_serial_number>0001</message_serial_number>
   </message_identification>
   <effective_day_time_frame>
      <beginning_date_time_group>
         <day>1</day>
         <hour_time>01</hour_time>
         <minute_time>00</minute_time>
         <time_zone>Z</time_zone>
         <month_name>JUNE</month_name>
         <year>2000</year>
      </beginning_date_time_group>
      <ending_date_time_group>
         <day>1</day>
         <hour_time>23</hour_time>
         <minute_time>59</minute_time>
         <time_zone>Z</time_zone>
         <month_name>JUNE</month_name>
         <year>2000</year>
      </ending_date_time_group>
   </effective_day_time_frame>

</ato_header_data>
```

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APPENDIX J. AIR TASKING ORDER HEADER DATA XSL STYLESHEET

```
<?xml version="1.0"?>
<!-- <xsl:stylesheet xmlns:xsl="http://www.w3.org/TR/WD-xsl"> --> <!-- Microsoft reference call -->

<xsl:stylesheet xmlns:xsl="http://www.w3.org/1999/XSL/Transform" version="1.0">   <!-- SAXON reference call -->
<xsl:output method="xml"/>

<!-- XXXXXXXCCXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX -->
<!-- This style sheet is used to create an XML document that contains the ATO header data.
     Style sheet users will be the Master Operational Document (MOD) care takers, which will
     import the data into the MOD via an external entity call.  The ATO header data will be
     stored in file ato_header_data.xml
                                                                                   -->
<!-- XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX -->

<xsl:template match="air_tasking_order">
  <ato_header_data>
    <xsl:apply-templates/>
</ato_header_data>


</xsl:template>

   <xsl:template match="operation_identification_data">
     <operation_identification_data>
       <xsl:apply-templates/>
     </operation_identification_data>
   </xsl:template>

      <xsl:template match="operation_codeword">
        <operation_codeword>
          <xsl:value-of select="."/>
        </operation_codeword>
      </xsl:template>

      <xsl:template match="plan_originator_and_number">
        <plan_originator_and_number>
          <xsl:value-of select="."/>
        </plan_originator_and_number>
      </xsl:template>
```

```
  <xsl:template match="option_nickname">
    <option_nickname>
      <xsl:value-of select="."/>
    </option_nickname>
  </xsl:template>

  <xsl:template match="secondary_option_nickname">
    <secondary_option_nickname>
      <xsl:value-of select="."/>
    </secondary_option_nickname>
  </xsl:template>

<xsl:template match="exercise_identification">
  <exercise_identification>
    <xsl:apply-templates/>
  </exercise_identification>
</xsl:template>


 <xsl:template match="exercise_nickname">
   <exercise_nickname>
     <xsl:value-of select="."/>
     </exercise_nickname>
   </xsl:template>

   <xsl:template match="exercise_message_additional_identifier">
     <exercise_message_additional_identifier>
       <xsl:value-of select="."/>
     </exercise_message_additional_identifier>
   </xsl:template>

<xsl:template match="message_identification">
  <message_identification>
    <xsl:apply-templates/>
  </message_identification>
</xsl:template>

   <xsl:template match="message_text_format_identifier">
     <message_text_format_identifier>
       <xsl:value-of select="."/>
     </message_text_format_identifier>
```

```
</xsl:template>

<xsl:template match="originator">
  <originator>
    <xsl:value-of select="."/>
  </originator>
</xsl:template>


<xsl:template match="message_serial_number">
  <message_serial_number>
    <xsl:value-of select="."/>
  </message_serial_number>
</xsl:template>

<xsl:template match="month_name">
  <month_name>
    <xsl:value-of select="."/>
  </month_name>
</xsl:template>

<xsl:template match="qualifier">
  <qualifier>
      <xsl:value-of select="."/>
    </qualifier>
</xsl:template>

<xsl:template match="serial_number_of_qualifier">
  <serial_number_of_qualifier>
    <xsl:value-of select="."/>
  </serial_number_of_qualifier>
</xsl:template>


<xsl:template match="effective_day_time_frame ">
  <effective_day_time_frame >
    <xsl:apply-templates/>
  </effective_day_time_frame >
</xsl:template>

<xsl:template match="beginning_date_time_group">
  <beginning_date_time_group>
```

```
      <xsl:apply-templates/>
    </beginning_date_time_group>
  </xsl:template>

    <xsl:template match="day">
      <day>
        <xsl:value-of select="."/>
      </day>
    </xsl:template>

    <xsl:template match="hour_time">
      <hour_time>
        <xsl:value-of select="."/>
      </hour_time>
    </xsl:template>

    <xsl:template match="minute_time">
      <minute_time>
      <xsl:value-of select="."/>
      </minute_time>
  </xsl:template>

  <xsl:template match="time_zone">
      <time_zone>
      <xsl:value-of select="."/>
      </time_zone>
    </xsl:template>


    <xsl:template match="month_name">
      <month_name>
      <xsl:value-of select="."/>
      </month_name>
    </xsl:template>

    <xsl:template match="year">
      <year>
      <xsl:value-of select="."/>
      </year>
    </xsl:template>
```

```
<xsl:template match="ending_date_time_group">
  <ending_date_time_group>
    <xsl:apply-templates/>
  </ending_date_time_group>
</xsl:template>

   <xsl:template match="day">
     <day>
       <xsl:value-of select="."/>
     </day>
   </xsl:template>

   <xsl:template match="hour_time">
     <hour_time>
       <xsl:value-of select="."/>
     </hour_time>
   </xsl:template>

   <xsl:template match="minute_time">
     <minute_time>
   <xsl:value-of select="."/>
   </minute_time>
 </xsl:template>

   <xsl:template match="time_zone">
     <time_zone>
     <xsl:value-of select="."/>
     </time_zone>
   </xsl:template>

   <xsl:template match="month_name">
     <month_name>
     <xsl:value-of select="."/>
     </month_name>
   </xsl:template>

   <xsl:template match="year">
     <year>
     <xsl:value-of select="."/>
     </year>
   </xsl:template>
```

```
  <xsl:template match="tasked_country_segment">
      <xsl:apply-templates select="xxx" mode="xxx"/>
  </xsl:template>

</xsl:stylesheet>
```

APPENDIX K. UNIT FLIGHT PLAN DOCUMENT TYPE DEFINITION

```
<!-- Document Type Definition (DTD) for unit_air_attack_plan.  This DTD will be imported in to
     the Master Operational Document (MOD) with the use of entities within the MOD.  This DTD
     will be used by every unit tasked within the Air Tasking Order (ATO) when creating their
     unit flight missions in an XML document.  The DTD has been separated into two sections.
     The first section defines children elements with only one parent.  The second section
     defines elements that are children with multiple parent elements.  To refine section 2
     further, section 2 will be subdivided into geographic location elements and time/date
     elements.
-->
<!-- xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx -->
<!--          DEBUGGING STATEMENTS. NOT INTENDED FOR USE IN THE MOD -->
<!--  <!DOCTYPE unit_air_attack_plan [ -->
<!--  <!ELEMENT unit_air_attack_plan (country_of_the_world, tasked_service, tasked_unit_and_location,
        aircraft_mission_data_segment) > -->
<!-- unit_air_attack_plan element must be deleted or contained in comments before linking to the MOD -->
<!-- xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx -->


<!-- xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx -->
<!-- Section 1 of DTD   Children elements with one parent -->
<!-- xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx -->

   <!ELEMENT country_of_the_world (#PCDATA)>
   <!ELEMENT tasked_service (#PCDATA)>
   <!ELEMENT tasked_unit_and_location (tasked_unit_designator, tasked_unit_location_taskunit?,
     aircraft_mission_data_segment+) >
      <!ELEMENT tasked_unit_designator (#PCDATA)>
      <!ELEMENT tasked_unit_location_taskunit (icao_base_name | place_name | geographic_location_lat_long_minutes)
>
         <!-- icao_base_name defined in section 2, Geographic location elements, Other location elements -->
         <!-- place_name defined in section 2, Geographic location elements, Other location elements -->
         <!ELEMENT geographic_location_lat_long_minutes (latitude_degrees, latitudinal_hemisphere,
            longitude_degrees, longitudinal_hemisphere, latitude_minute_angular, longitude_minute_angular) >
            <!-- all children are defined in section 2, Geographic location elements, Latitude/Longitude location
elements -->
      <!ELEMENT aircraft_mission_data_segment (individual_aircraft_mission_data, ground_target_location*,
        mission_routing_data) >
            <!ELEMENT individual_aircraft_mission_data (number_of_aircraft, type_of_aircraft, aircraft_call_sign,
             primary_configuration_code, secondary_configuration_code, mission_number, primary_mission_type,
             secondary_mission_type) >
```

```
<!ELEMENT number_of_aircraft (#PCDATA)>
<!ELEMENT type_of_aircraft (aircraft_type_and_model | aircraft_type_and_model_other) >
   <!ELEMENT aircraft_type_and_model (#PCDATA)>
   <!ELEMENT aircraft_type_and_model_other (#PCDATA)>
<!ELEMENT aircraft_call_sign (#PCDATA)>
<!ELEMENT primary_configuration_code (#PCDATA)>
<!ELEMENT secondary_configuration_code (#PCDATA)>
<!ELEMENT mission_number (#PCDATA)>
<!ELEMENT primary_mission_type (#PCDATA)>
<!ELEMENT secondary_mission_type (#PCDATA)>
<!ELEMENT ground_target_location (target_type, target_priority?, time_on_target_gtgtloc,
 desired_mean_point_of_impact_gtgtloc) >
<!ELEMENT target_type (#PCDATA)>
<!ELEMENT target_priority (#PCDATA)>
<!ELEMENT time_on_target_gtgtloc (day_time_and_month_tasked_on_target |
  day_time_on_target_to_the_second) >
   <!ELEMENT day_time_and_month_tasked_on_target (day, hour_time, minute_time, time_zone,
     month_name) >
     <!-- all children are defined in section 2, Time/Date elements -->


<!ELEMENT day_time_on_target_to_the_second (day, hour_time, minute_time, second_time,
     time_zone_zulu) >
     <!-- all children are defined in section 2, Time/Date elements -->
<!ELEMENT desired_mean_point_of_impact_gtgtloc (dmpi_lat_long_minutes | dmpi_lat_long_seconds |
dmpi_lat_long_deciseconds | dmpi_lat_long_centiseconds | dmpi_lat_long_thousandths_of_minute |
dmpi_lat_long_ten_thousandths_of_minute) >
   <!ELEMENT dmpi_lat_long_minutes (latitude_degrees, latitudinal_hemisphere, longitude_degrees,
     longitudinal_hemisphere, latitude_minute_angular, longitude_minute_angular) >
     <!-- all children are defined in section 2, Geographic location elements, Latitude/Longitude
       location elements -->
   <!ELEMENT dmpi_lat_long_seconds (latitude_degrees, latitudinal_hemisphere, longitude_degrees,
     longitudinal_hemisphere, latitude_minute_angular, longitude_minute_angular,
     latitude_seconds_angular, longitude_seconds_angular) >
   <!-- all children are defined in section 2, Geographic location elements, Latitude/Longitude
     location elements -->
   <!ELEMENT dmpi_lat_long_deciseconds (latitude_degrees, latitudinal_hemisphere,
     longitude_degrees, longitudinal_hemisphere, latitude_minute_angular, longitude_minute_angular,
     latitude_deciseconds_angular, longitude_deciseconds_angular) >
   <!-- all children are defined in section 2, Geographic location elements, Latitude/Longitude
     location elements -->
```

```
<!ELEMENT dmpi_lat_long_centiseconds (latitude_degrees, latitudinal_hemisphere,
  longitude_degrees, longitudinal_hemisphere, latitude_minute_angular, longitude_minute_angular,
  latitude_centiseconds_angular, longitude_centiseconds_angular) >
<!-- all children are defined in section 2, Geographic location elements, Latitude/Longitude
  location elements -->
<!ELEMENT dmpi_lat_long_thousandths_of_minute (latitude_degrees, latitude_minute_angular,
  decimal, thousandth_of_minute_of_latitude, latitudinal_hemisphere, longitude_degrees,
  longitude_minute_angular, decimal, thousandth_of_minute_of_longitude, longitudinal_hemisphere)
  >
<!-- all children are defined in section 2, Geographic location elements, Latitude/Longitude
  location elements -->
<!ELEMENT dmpi_lat_long_ten_thousandths_of_minute (latitude_degrees, latitude_minute_angular,
  decimal, ten_thousandth_of_minute_of_latitude, latitudinal_hemisphere, longitude_degrees,
  longitude_minute_angular, decimal, ten_thousandth_of_minute_of_longitude,
  longitudinal_hemisphere) >
<!-- all children are defined in section 2, Geographic location elements, Latitude/Longitude
  location elements -->
<!ELEMENT dmpi_utm_1_meter (utm_grid_zone_designation, utm_grid_zone_hemisphere,
  utm_grid_zone_row, utm_100000_meter_square_row, utm_1_meter_northing, utm_grid_zone_column,
  utm_100000_meter_square_column, utm_1_meter_easting) >
 <!-- all children are defined in section 2, Geographic location elements, UTM location elements
  -->

<!ELEMENT mission_routing_data ( day_time_and_month_of_start, day_time_and_month_of_stop,
    takeoff_position, route_field_group) >
  <!ELEMENT day_time_and_month_of_start (day, hour_time, minute_time, time_zone, month_name) >
    <!-- all children are defined in section 2, Time/Date elements -->
  <!ELEMENT day_time_and_month_of_stop (day, hour_time, minute_time, time_zone, month_name) >
    <!-- all children are defined in section 2, Time/Date elements -->
  <!ELEMENT takeoff_position ((takeoff_position_lat_long_degrees | takeoff_position_lat_long_minutes
   | takeoff_position_lat_long_seconds | takeoff_position_verified_lat_long_degrees |
   takeoff_position_verified_lat_long_minutes | takeoff_position_verified_lat_long_seconds |
   takeoff_position_utm_1000_meter | takeoff_position_utm_100_meter | takeoff_position_utm_10_meter |
   takeoff_position_utm_1_meter), (takeoff_elevation_in_feet | takeoff_elevation_in_meters)) >
        <!ELEMENT takeoff_position_lat_long_degrees (latitude_degrees, latitudinal_hemisphere,
          longitude_degrees, longitudinal_hemisphere) >
          <!-- all children are defined in section 2, Geographic location elements,
          Latitude/Longitude location elements -->
        <!ELEMENT takeoff_position_lat_long_minutes (latitude_degrees, latitudinal_hemisphere,
          longitude_degrees, longitudinal_hemisphere, latitude_minute_angular,
          longitude_minute_angular) >
```

```
    <!-- all children are defined in section 2, Geographic location elements,
    Latitude/Longitude location elements -->
  <!ELEMENT takeoff_position_lat_long_seconds (latitude_degrees, latitudinal_hemisphere,
    longitude_degrees, longitudinal_hemisphere, latitude_minute_angular,
    longitude_minute_angular, latitude_seconds_angular, longitude_seconds_angular) >
    <!-- all children are defined in section 2, Geographic location elements,
    Latitude/Longitude location elements -->
  <!ELEMENT takeoff_position_verified_lat_long_degrees (latitude_degrees,
    latitudinal_hemisphere, longitude_degrees, longitudinal_hemisphere) >
    <!-- all children are defined in section 2, Geographic location elements,
    Latitude/Longitude location elements -->
  <!ELEMENT takeoff_position_verified_lat_long_minutes (latitude_degrees,
    latitudinal_hemisphere, longitude_degrees, longitudinal_hemisphere,
    latitude_minute_angular, longitude_minute_angular) >
    <!-- all children are defined in section 2, Geographic location elements,
    Latitude/Longitude location elements -->
  <!ELEMENT takeoff_position_verified_lat_long_seconds (latitude_degrees,
    latitudinal_hemisphere, longitude_degrees, longitudinal_hemisphere,
    latitude_minute_angular, longitude_minute_angular, latitude_seconds_angular,
    longitude_seconds_angular) >
  <!-- all children are defined in section 2, Geographic location elements,
      Latitude/Longitude location elements -->
<!ELEMENT takeoff_position_utm_1000_meter (utm_grid_zone_designation,
    utm_grid_zone_hemisphere, utm_grid_zone_row, utm_100000_meter_square_row,
    utm_1000_meter_northing, utm_grid_zone_column, utm_100000_meter_square_column,
      utm_1000_meter_easting) >
    <!-- all children are defined in section 2, Geographic location elements, UTM location
        elements -->
  <!ELEMENT takeoff_position_utm_100_meter (utm_grid_zone_designation,
    utm_grid_zone_hemisphere, utm_grid_zone_row, utm_100000_meter_square_row,
    utm_100_meter_northing, utm_grid_zone_column, utm_100000_meter_square_column,
    utm_100_meter_easting) >
    <!-- all children are defined in section 2, Geographic location elements, UTM location
    elements -->
  <!ELEMENT takeoff_position_utm_10_meter (utm_grid_zone_designation,
    utm_grid_zone_hemisphere, utm_grid_zone_row, utm_100000_meter_square_row,
    utm_10_meter_northing, utm_grid_zone_column, utm_100000_meter_square_column,
    utm_10_meter_easting) >
    <!-- all children are defined in section 2, Geographic location elements, UTM location
    elements -->
  <!ELEMENT takeoff_position_utm_1_meter (utm_grid_zone_designation,
    utm_grid_zone_hemisphere, utm_grid_zone_row, utm_100000_meter_square_row,
```

```
            utm_1_meter_northing, utm_grid_zone_column, utm_100000_meter_square_column,
            utm_1_meter_easting) >
            <!-- all children are defined in section 2, Geographic location elements, UTM location
                 elements -->
         <!ELEMENT takeoff_elevation_in_feet (#PCDATA)>
         <!ELEMENT takeoff_elevation_in_meters (#PCDATA)>
<!ELEMENT route_field_group (route_point_route, time_of_position_route) >
   <!ELEMENT route_point_route (point_and_altitude*) >
      <!ELEMENT point_and_altitude ((route_point_lat_long_degrees | route_point_lat_long_minutes |
        route_point_lat_long_seconds | route_point_verified_lat_long_degrees |
        route_point_verified_lat_long_minutes | route_point_verified_lat_long_seconds |
        route_point_utm_1000_meter | route_point_utm_100_meter | route_point_utm_10_meter |
        route_point_utm_1_meter | route_point_georef_minute | route_point_georef_centiminute |
        route_point_abbrev_georef_minute | route_point_abbrev_georef_centiminute | icao_base_name),
        (route_point_altitude_in_hundreds_of_feet | route_point_altitude_in_meters)) >
       <!ATTLIST point_and_altitude route_point_number CDATA #REQUIRED>
         <!ELEMENT route_point_lat_long_degrees (latitude_degrees, latitudinal_hemisphere,
            longitude_degrees, longitudinal_hemisphere) >
            <!-- all children are defined in section 2, Geographic location elements,
            Latitude/Longitude location elements -->
      <!ELEMENT route_point_lat_long_minutes (latitude_degrees, latitudinal_hemisphere,
        longitude_degrees, longitudinal_hemisphere, latitude_minute_angular,
        longitude_minute_angular) >
            <!-- all children are defined in section 2, Geographic location elements,
            Latitude/Longitude location elements -->


        <!ELEMENT route_point_lat_long_seconds (latitude_degrees, latitudinal_hemisphere,
            longitude_degrees, longitudinal_hemisphere, latitude_minute_angular,
            longitude_minute_angular, latitude_seconds_angular, longitude_seconds_angular) >
            <!-- all children are defined in section 2, Geographic location elements,
            Latitude/Longitude location elements -->
         <!ELEMENT route_point_verified_lat_long_degrees (latitude_degrees, latitudinal_hemisphere,
            longitude_degrees, longitudinal_hemisphere) >
            <!-- all children are defined in section 2, Geographic location elements,
            Latitude/Longitude location elements -->
         <!ELEMENT route_point_verified_lat_long_minutes (latitude_degrees, latitudinal_hemisphere,
            longitude_degrees, longitudinal_hemisphere, latitude_minute_angular,
            longitude_minute_angular) >
            <!-- all children are defined in section 2, Geographic location elements,
            Latitude/Longitude location elements -->
```

```
<!ELEMENT route_point_verified_lat_long_seconds (latitude_degrees, latitudinal_hemisphere,
   longitude_degrees, longitudinal_hemisphere, latitude_minute_angular,
   longitude_minute_angular, latitude_seconds_angular, longitude_seconds_angular) >
   <!-- all children are defined in section 2, Geographic location elements,
   Latitude/Longitude location elements -->
<!ELEMENT route_point_utm_1000_meter (utm_grid_zone_designation, utm_grid_zone_hemisphere,
   utm_grid_zone_row, utm_100000_meter_square_row, utm_1000_meter_northing,
   utm_grid_zone_column, utm_100000_meter_square_column, utm_1000_meter_easting) >
   <!-- all children are defined in section 2, Geographic location elements, UTM location
   elements -->
<!ELEMENT route_point_utm_100_meter (utm_grid_zone_designation, utm_grid_zone_hemisphere,
   utm_grid_zone_row, utm_100000_meter_square_row, utm_100_meter_northing,
   utm_grid_zone_column, utm_100000_meter_square_column, utm_100_meter_easting) >
   <!-- all children are defined in section 2, Geographic location elements, UTM location
   elements -->
<!ELEMENT route_point_utm_10_meter (utm_grid_zone_designation, utm_grid_zone_hemisphere,
   utm_grid_zone_row, utm_100000_meter_square_row, utm_10_meter_northing,
   utm_grid_zone_column, utm_100000_meter_square_column, utm_10_meter_easting) >
   <!-- all children are defined in section 2, Geographic location elements, UTM location
   elements -->
<!ELEMENT route_point_utm_1_meter (utm_grid_zone_designation, utm_grid_zone_hemisphere,
  utm_grid_zone_row, utm_100000_meter_square_row, utm_1_meter_northing, utm_grid_zone_column,
  utm_100000_meter_square_column, utm_1_meter_easting) >
   <!-- all children are defined in section 2, Geographic location elements, UTM location
   elements -->
<!ELEMENT route_point_georef_minute (fifteen_degree_quadrilateral_georef,
   one_degree_quadrilateral_georef, minute_easting_georef, minute_northing_georef) >
<!-- all children are defined in section 2, Geographic location elements, Georeference
      location elements -->


<!ELEMENT route_point_georef_centiminute (fifteen_degree_quadrilateral_georef,
   one_degree_quadrilateral_georef, minute_easting_georef, minute_northing_georef,
   centiminute_angular_easting, centiminute_angular_northing) >
   <!-- all children are defined in section 2, Geographic location elements, Georeference
   location elements -->
<!ELEMENT route_point_abbrev_georef_minute (fifteen_degree_quadrilateral_georef,
   one_degree_quadrilateral_georef, minute_easting_georef, minute_northing_georef) >
   <!-- all children are defined in section 2, Geographic location elements, Georeference
   location elements -->
```

```
        <!ELEMENT route_point_abbrev_georef_centiminute (fifteen_degree_quadrilateral_georef,
          one_degree_quadrilateral_georef, minute_easting_georef, minute_northing_georef,
          centiminute_angular_easting, centiminute_angular_northing) >
          <!-- all children are defined in section 2, Geographic location elements, Georeference
          location elements -->
        <!-- icao_base_name is defined in section 2, Geographic location elements, Other location
          elements -->
        <!ELEMENT route_point_altitude_in_hundreds_of_feet (#PCDATA)>
        <!ELEMENT route_point_altitude_in_meters (#PCDATA)>
    <!ELEMENT time_of_position_route (cumulative_ato_time_in_seconds | position_day_time |
     time_at_position | verified_day_time_of_position | verified_month_day_time_at_transit_point)*
     >
      <!ELEMENT cumulative_ato_time_in_seconds (#PCDATA) >
       <!ATTLIST cumulative_ato_time_in_seconds route_point_number CDATA #REQUIRED>
      <!ELEMENT position_day_time (day, hour_time, minute_time, time_zone) >
       <!ATTLIST position_day_time route_point_number CDATA #REQUIRED>
        <!-- all children are defined in section 2, Time/Date elements -->
      <!ELEMENT time_at_position (hour_time, minute_time) >
       <!ATTLIST time_at_position route_point_number CDATA #REQUIRED>
        <!-- all children are defined in section 2, Time/Date elements -->
    <!ELEMENT verified_day_time_of_position (day, hour_time, minute_time, time_zone) >
     <!ATTLIST verified_day_time_of_position route_point_number CDATA #REQUIRED>
      <!-- all children are defined in section 2, Time/Date elements -->
      <!ELEMENT verified_month_day_time_at_transit_point (day, hour_time, minute_time, time_zone,
        month_name) >
       <!ATTLIST verified_month_day_time_at_transit_point route_point_number CDATA #REQUIRED>
        <!-- all children are defined in section 2, Time/Date elements -->

<!-- xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx -->
<!--  Section 2 of DTD   Children elments with multiple parents -->
<!-- xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx -->

    <!-- Geographic location elements -->

      <!-- Latitude/Longitude location elements -->

        <!ELEMENT latitude_degrees (#PCDATA)>
        <!ELEMENT latitudinal_hemisphere (#PCDATA)>
        <!ELEMENT longitude_degrees (#PCDATA)>
        <!ELEMENT longitudinal_hemisphere (#PCDATA)>
        <!ELEMENT latitude_minute_angular (#PCDATA)>
        <!ELEMENT longitude_minute_angular (#PCDATA)>
```

```
   <!ELEMENT latitude_seconds_angular (#PCDATA)>
   <!ELEMENT longitude_seconds_angular (#PCDATA)>
   <!ELEMENT latitude_deciseconds_angular (#PCDATA)>
   <!ELEMENT longitude_deciseconds_angular (#PCDATA)>
   <!ELEMENT latitude_centiseconds_angular (#PCDATA)>
   <!ELEMENT longitude_centiseconds_angular (#PCDATA)>
   <!ELEMENT decimal (#PCDATA)>
   <!ELEMENT thousandth_of_minute_of_latitude (#PCDATA)>
   <!ELEMENT thousandth_of_minute_of_longitude (#PCDATA)>
   <!ELEMENT ten_thousandth_of_minute_of_latitude (#PCDATA)>
   <!ELEMENT ten_thousandth_of_minute_of_longitude (#PCDATA)>

<!-- UTM location elements -->

   <!ELEMENT utm_grid_zone_designation (#PCDATA)>
   <!ELEMENT utm_grid_zone_hemisphere (#PCDATA)>
   <!ELEMENT utm_grid_zone_row (#PCDATA)>
   <!ELEMENT utm_100000_meter_square_row (#PCDATA)>
   <!ELEMENT utm_1000_meter_northing (#PCDATA)>
   <!ELEMENT utm_100_meter_northing (#PCDATA)>
   <!ELEMENT utm_10_meter_northing (#PCDATA)>
   <!ELEMENT utm_1_meter_northing (#PCDATA)>
   <!ELEMENT utm_grid_zone_column (#PCDATA)>
   <!ELEMENT utm_100000_meter_square_column (#PCDATA)>
   <!ELEMENT utm_1000_meter_easting (#PCDATA)>
   <!ELEMENT utm_100_meter_easting (#PCDATA)>
   <!ELEMENT utm_10_meter_easting (#PCDATA)>
   <!ELEMENT utm_1_meter_easting (#PCDATA)>

<!-- Georeference location elements -->

   <!ELEMENT fifteen_degree_quadrilateral_georef (#PCDATA)>
   <!ELEMENT one_degree_quadrilateral_georef (#PCDATA)>
   <!ELEMENT minute_easting_georef (#PCDATA)>
   <!ELEMENT minute_northing_georef (#PCDATA)>
   <!ELEMENT centiminute_angular_easting (#PCDATA)>
   <!ELEMENT centiminute_angular_northing (#PCDATA)>

<!-- Other location elements -->
   <!ELEMENT icao_base_name (#PCDATA)>
```

```
        <!ELEMENT place_name (#PCDATA)>

    <!-- Time/date elements -->

        <!ELEMENT day (#PCDATA)>
        <!ELEMENT hour_time (#PCDATA)>
        <!ELEMENT minute_time (#PCDATA)>
        <!ELEMENT second_time (#PCDATA)>
        <!ELEMENT time_zone_zulu (#PCDATA)>
        <!ELEMENT time_zone (#PCDATA)>
        <!ELEMENT month_name (#PCDATA)>

<!-- ] -->
```

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APPENDIX L. 101AIRCAV FINAL UNIT FLIGHT PLAN IN XML


```xml
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               </tasked_unit_location_taskunit>
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```

```
            <utm_grid_zone_row>39</utm_grid_zone_row>
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```

APPENDIX M. 100TFW FINAL UNIT FLIGHT PLAN IN XML


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```xml
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APPENDIX N. 4TFW FINAL UNIT FLIGHT PLAN IN XML CREATED FROM THE AIR TASKING ORDER


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      <utm_100000_meter_square_column>69</utm_100000_meter_square_column>
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```
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                    <cumulative_ato_time_in_seconds
route_point_number="3">954.76</cumulative_ato_time_in_seconds>
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route_point_number="4">1166.39</cumulative_ato_time_in_seconds>
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                    <cumulative_ato_time_in_seconds
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route_point_number="7">1497.33</cumulative_ato_time_in_seconds>
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route_point_number="10">1876.44</cumulative_ato_time_in_seconds>
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</unit_air_attack_plan>
```

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</aircraft_mission_data_segment>

<aircraft_mission_data_segment>
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         </type_of_aircraft>
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         <primary_configuration_code>HELLFIRE</primary_configuration_code>
         <secondary_configuration_code/>
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    <primary_mission_type>INT</primary_mission_type>
      <secondary_mission_type/>
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          <target_priority>1D</target_priority>
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                <second_time>32</second_time>
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```

```
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            </desired_mean_point_of_impact_gtgtloc>
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  </unit_air_attack_plan>
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APPENDIX P. 100TFW PARTIAL UNIT FLIGHT PLAN IN XML CREATED FROM THE AIR TASKING ORDER


```xml
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<unit_air_attack_plan>
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            <tasked_service>USAF</tasked_service>
            <tasked_unit_and_location>
               <tasked_unit_designator>100TFW</tasked_unit_designator>
               <tasked_unit_location_taskunit>
                  <place_name>29 PALMS AIRSTRIP</place_name>
               </tasked_unit_location_taskunit>
            </tasked_unit_and_location>
            <aircraft_mission_data_segment>
                  <individual_aircraft_mission_data>
                     <number_of_aircraft>1</number_of_aircraft>
                     <type_of_aircraft>
                        <aircraft_type_and_model>F15</aircraft_type_and_model>
                     </type_of_aircraft>
                  <aircraft_call_sign>THUNDER1</aircraft_call_sign>
                  <primary_configuration_code>GBU10</primary_configuration_code>
                  <secondary_configuration_code/>
                  </individual_aircraft_mission_data>
                  <mission_number>AIRSTRIP01</mission_number>
                  <primary_mission_type>INT</primary_mission_type>
                  <secondary_mission_type/>
                  <ground_target_location>
                      <target_type>AIRSTRIP</target_type>
                      <target_priority>1D</target_priority>
                      <time_on_target_gtgtloc>
                         <day_time_on_target_to_the_second>
                            <day>1</day>
                            <hour_time>1</hour_time>
                            <minute_time>53</minute_time>
                            <second_time>8</second_time>
                            <time_zone_zulu>Z</time_zone_zulu>
                         </day_time_on_target_to_the_second>
                      </time_on_target_gtgtloc>
                      <desired_mean_point_of_impact_gtgtloc>
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                            <utm_grid_zone_designation>11</utm_grid_zone_designation>
```

```
            <utm_grid_zone_hemisphere>N</utm_grid_zone_hemisphere>
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            <utm_100000_meter_square_column>29</utm_100000_meter_square_column>
            <utm_1_meter_easting>850</utm_1_meter_easting>
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<aircraft_mission_data_segment>

   <individual_aircraft_mission_data>
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      <type_of_aircraft>
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      </type_of_aircraft>
      <aircraft_call_sign>THUNDER2</aircraft_call_sign>
      <primary_configuration_code>GBU10</primary_configuration_code>
   <secondary_configuration_code/>
  </individual_aircraft_mission_data>

   <mission_number>AIRSTRIP02</mission_number>
   <primary_mission_type>INT</primary_mission_type>
   <secondary_mission_type/>

   <ground_target_location>
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      <target_priority>1D</target_priority>

      <time_on_target_gtgtloc>
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```

```
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              <utm_grid_zone_hemisphere>N</utm_grid_zone_hemisphere>
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              <utm_1_meter_northing>250</utm_1_meter_northing>
              <utm_grid_zone_column>5</utm_grid_zone_column>
              <utm_100000_meter_square_column>29</utm_100000_meter_square_column>
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           </dmpi_utm_1_meter>
        </desired_mean_point_of_impact_gtgtloc>
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<aircraft_mission_data_segment>

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       <secondary_configuration_code/>
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        <target_priority>1D</target_priority>

        <time_on_target_gtgtloc>
           <day_time_on_target_to_the_second>
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              <hour_time>1</hour_time>
```

```xml
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            <utm_grid_zone_hemisphere>N</utm_grid_zone_hemisphere>
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</unit_air_attack_plan>
```

APPENDIX Q. 4TFW PARTIAL UNIT FLIGHT PLAN IN XML


```
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                     </type_of_aircraft>
                     <aircraft_call_sign>UNCLESAM1</aircraft_call_sign>
                     <primary_configuration_code>GBU10</primary_configuration_code>
                     <secondary_configuration_code/>
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                  <mission_number>SAM1</mission_number>
                  <primary_mission_type>INT</primary_mission_type>
                  <secondary_mission_type/>


                  <ground_target_location>
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                      <target_priority>1D</target_priority>

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                            <day>1</day>
```

```
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<aircraft_mission_data_segment>

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    <mission_number>SAM2</mission_number>
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    <secondary_mission_type/>


    <ground_target_location>
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```xml
<target_priority>1D</target_priority>

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      <minute_time>19</minute_time>
      <second_time>26</second_time>
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   </day_time_on_target_to_the_second>
</time_on_target_gtgtloc>
<desired_mean_point_of_impact_gtgtloc>
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      <utm_grid_zone_hemisphere>N</utm_grid_zone_hemisphere>
      <utm_grid_zone_row>39</utm_grid_zone_row>
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      <utm_1_meter_northing>000</utm_1_meter_northing>
      <utm_grid_zone_column>5</utm_grid_zone_column>
      <utm_100000_meter_square_column>29</utm_100000_meter_square_column>
   <utm_1_meter_easting>000</utm_1_meter_easting>
  </dmpi_utm_1_meter>
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</aircraft_mission_data_segment>

<aircraft_mission_data_segment>

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    <target_priority>1D</target_priority>

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</unit_air_attack_plan>
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APPENDIX R. UNIT FLIGHT PLAN XSL STYLESHEET

```
<?xml version="1.0"?>
<!-- <xsl:stylesheet xmlns:xsl="http://www.w3.org/TR/WD-xsl"> --> <!-- Microsoft reference call -->

<xsl:stylesheet xmlns:xsl="http://www.w3.org/1999/XSL/Transform" version="1.0">   <!-- SAXON reference call -->
<xsl:output method="xml"/>

<!-- XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX  -->
<!-- This style sheet is used to create an XML document that contains the framework for unit's
     air attack plan.  Style sheet users will be the 100 TFW that's assigned to a task force and
     specified within the ATO. The Units will use the style sheet create the framework of their
     detailed unit air attack plans.

     The ATO header data will be stored in the file 100TFW_air_attack_plan.xml-->
<!-- XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX -->


<xsl:template match="air_tasking_order_root">
    <xsl:apply-templates/>
  </xsl:template>

   <xsl:template match="air_tasking_order">
     <unit_air_attack_plan>
       <xsl:apply-templates/>
     </unit_air_attack_plan>
   </xsl:template>

     <xsl:template match="operation_identification_data"/>

     <xsl:template match="exercise_identification"/>

     <xsl:template match="message_identification"/>

     <xsl:template match="effective_day_time_frame"/>

     <xsl:template match="tasked_country_segment">
      <xsl:choose>
```

```
    <xsl:when test="tasked_country/country_of_the_world='USA'">
      <xsl:apply-templates/>
    </xsl:when>
   </xsl:choose>
  </xsl:template>

<!--    <xsl:template match="tasked_country_segment">
        <xsl:apply-templates/>
    </xsl:template>
-->

      <xsl:template match="tasked_country">
          <xsl:apply-templates/>
      </xsl:template>

         <xsl:template match="country_of_the_world">
            <country_of_the_world>
               <xsl:value-of select="."/>
            </country_of_the_world>
         </xsl:template>

    <xsl:template match="service_tasked_segment">
       <xsl:choose>
            <xsl:when test="service_tasked/tasked_service='ARMY'">
         <!-- OR <xsl:when test="service_tasked/tasked_service='USAF'"> for 100TFW and 4TFW ->
               <xsl:apply-templates/>
            </xsl:when>
         </xsl:choose>
      </xsl:template>

<!--   <xsl:template match="service_tasked_segment">
           <xsl:apply-templates/>
       </xsl:template>
-->
          <xsl:template match="service_tasked">
             <xsl:apply-templates/>
          </xsl:template>

             <xsl:template match="tasked_service">
                <tasked_service>
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```

```
    </xsl:template>

<xsl:template match="task_unit_and_location_segment">
   <xsl:choose>
      <xsl:when test="tasked_unit_and_location/tasked_unit_designator='101AIRCAV'">
   <!-- OR <xsl:when test="tasked_unit_and_location/tasked_unit_designator='101AIRCAV'"> for 100TFW -->
   <!-- OR <xsl:when test="tasked_unit_and_location/tasked_unit_designator='101AIRCAV'"> for 4TFW -->

         <xsl:apply-templates/>
      </xsl:when>
   </xsl:choose>
</xsl:template>

<!--        <xsl:template match="task_unit_and_location_segment">
           <xsl:apply-templates/>
         </xsl:template>
-->
           <xsl:template match="tasked_unit_and_location">
            <tasked_unit_and_location>
               <xsl:apply-templates/>
            </tasked_unit_and_location>
           </xsl:template>

              <xsl:template match="tasked_unit_designator">
                 <tasked_unit_designator>
                    <xsl:value-of select="."/>
                 </tasked_unit_designator>
              </xsl:template>

              <xsl:template match="tasked_unit_location_taskunit">
                 <tasked_unit_location_taskunit>
                    <xsl:apply-templates/>
                 </tasked_unit_location_taskunit>
              </xsl:template>

                 <xsl:template match="icao_base_name">
                    <icao_base_name>
                       <xsl:value-of select="."/>
                    </icao_base_name>
                 </xsl:template>
```

```
<xsl:template match="place_name">
   <place_name>
      <xsl:value-of select="."/>
   </place_name>
</xsl:template>

<xsl:template match="geographic_location_lat_long_minutes">
   <geographic_location_lat_long_minutes>
      <xsl:apply-templates/>
   </geographic_location_lat_long_minutes>
</xsl:template>

   <xsl:template match="latitude_degrees">
      <latitude_degrees>
        <xsl:value-of select="."/>
      </latitude_degrees>
   </xsl:template>

   <xsl:template match="latitudinal_hemisphere">
    <latitudinal_hemisphere>
      <xsl:value-of select="."/>
    </latitudinal_hemisphere>
   </xsl:template>

   <xsl:template match="longitude_degrees">
      <longitude_degrees>
        <xsl:value-of select="."/>
      </longitude_degrees>
   </xsl:template>

   <xsl:template match="longitudinal_hemisphere">
      <longitudinal_hemisphere>
        <xsl:value-of select="."/>
      </longitudinal_hemisphere>
   </xsl:template>

   <xsl:template match="latitude_minute_angular">
      <latitude_minute_angular>
        <xsl:value-of select="."/>
      </latitude_minute_angular>
   </xsl:template>
```

```
<xsl:template match="longitude_minute_angular">
   <longitude_minute_angular>
     <xsl:value-of select="."/>
   </longitude_minute_angular>
</xsl:template>


<xsl:template match="aircraft_mission_data_segment">
   <aircraft_mission_data_segment>
      <xsl:apply-templates/>
   </aircraft_mission_data_segment>
</xsl:template>

      <xsl:template match="individual_aircraft_mission_data_segment">
            <xsl:apply-templates/>
      </xsl:template>

         <xsl:template match="individual_aircraft_mission_data">
            <individual_aircraft_mission_data>
             <xsl:apply-templates/>
          </individual_aircraft_mission_data>
       </xsl:template>

            <xsl:template match="number_of_aircraft">
              <number_of_aircraft>
                <xsl:value-of select="."/>
              </number_of_aircraft>
            </xsl:template>

            <xsl:template match="type_of_aircraft">
               <type_of_aircraft>
                  <xsl:apply-templates/>
               </type_of_aircraft>
            </xsl:template>

               <xsl:template match="aircraft_type_and_model">
                  <aircraft_type_and_model>
                    <xsl:value-of select="."/>
                  </aircraft_type_and_model>
               </xsl:template>
```

```
    <xsl:template match="aircraft_type_and_model_other">
       <aircraft_type_and_model_other>
         <xsl:value-of select="."/>
       </aircraft_type_and_model_other>
    </xsl:template>

<xsl:template match="aircraft_call_sign">
   <aircraft_call_sign>
     <xsl:value-of select="."/>
   </aircraft_call_sign>
</xsl:template>

<xsl:template match="primary_configuration_code">
   <primary_configuration_code>
     <xsl:value-of select="."/>
   </primary_configuration_code>
</xsl:template>

<xsl:template match="secondary_configuration_code">
   <secondary_configuration_code>
   <xsl:value-of select="."/>
  </secondary_configuration_code>
</xsl:template>


<xsl:template match="aircraft_mission_data">
      <xsl:apply-templates/>
</xsl:template>

    <xsl:template match="mission_number">
       <mission_number>
          <xsl:value-of select="."/>
       </mission_number>
    </xsl:template>

    <xsl:template match="primary_mission_type">
       <primary_mission_type>
          <xsl:value-of select="."/>
       </primary_mission_type>
    </xsl:template>

    <xsl:template match="secondary_mission_type">
```

```
      <secondary_mission_type>
         <xsl:value-of select="."/>
      </secondary_mission_type>
   </xsl:template>

<xsl:template match="aircraft_mission_location_segment">
      <xsl:apply-templates/>
</xsl:template>

   <xsl:template match="ground_target_location">
      <ground_target_location>
         <xsl:apply-templates/>
      </ground_target_location>
   </xsl:template>

      <xsl:template match="target_type">
         <target_type>
            <xsl:value-of select="."/>
         </target_type>
   </xsl:template>

   <xsl:template match="target_priority">
         <target_priority>
            <xsl:value-of select="."/>
         </target_priority>
      </xsl:template>

      <xsl:template match="primary_aternate_designator">
         <xsl:apply-templates select="xxx" mode="xxx"/>
      </xsl:template>

      <xsl:template match="time_on_target_gtgtloc">
         <time_on_target_gtgtloc>
            <xsl:apply-templates/>
         </time_on_target_gtgtloc>
      </xsl:template>

         <xsl:template match="day_time_and_month_tasked_on_target">
            <day_time_and_month_tasked_on_target>
               <xsl:apply-templates/>
            </day_time_and_month_tasked_on_target>
```

```
</xsl:template>

   <xsl:template match="day">
      <day>
         <xsl:value-of select="."/>
      </day>
   </xsl:template>

   <xsl:template match="hour_time">
      <hour_time>
         <xsl:value-of select="."/>
      </hour_time>
   </xsl:template>

   <xsl:template match="minute_time">
      <minute_time>
         <xsl:value-of select="."/>
      </minute_time>
   </xsl:template>

 <xsl:template match="time_zone">
    <time_zone>
       <xsl:value-of select="."/>
      </time_zone>
   </xsl:template>

   <xsl:template match="month_name">
      <month_name>
         <xsl:value-of select="."/>
      </month_name>
   </xsl:template>


<xsl:template match="day_time_on_target_to_the_second">
   <day_time_on_target_to_the_second>
      <xsl:apply-templates/>
   </day_time_on_target_to_the_second>
</xsl:template>

   <xsl:template match="day">
      <day>
         <xsl:value-of select="."/>
```

```
      </day>
   </xsl:template>

   <xsl:template match="hour_time">
      <hour_time>
         <xsl:value-of select="."/>
      </hour_time>
   </xsl:template>

   <xsl:template match="minute_time">
      <minute_time>
         <xsl:value-of select="."/>
      </minute_time>
   </xsl:template>

   <xsl:template match="second_time">
      <second_time>
         <xsl:value-of select="."/>
      </second_time>
   </xsl:template>

  <xsl:template match="time_zone_zulu">
     <time_zone_zulu>
         <xsl:value-of select="."/>
      </time_zone_zulu>
   </xsl:template>


<xsl:template match="desired_mean_point_of_impact_gtgtloc">
   <desired_mean_point_of_impact_gtgtloc>
      <xsl:apply-templates/>
   </desired_mean_point_of_impact_gtgtloc>
</xsl:template>

   <xsl:template match="dmpi_lat_long_minutes">
      <dmpi_lat_long_minutes>
         <xsl:apply-templates/>
      </dmpi_lat_long_minutes>
   </xsl:template>

      <xsl:template match="latitude_degrees">
         <latitude_degrees>
```

```
         <xsl:value-of select="."/>
      </latitude_degrees>
   </xsl:template>

   <xsl:template match="latitudinal_hemisphere">
      <latitudinal_hemisphere>
         <xsl:value-of select="."/>
      </latitudinal_hemisphere>
   </xsl:template>

   <xsl:template match="longitude_degrees">
      <longitude_degrees>
         <xsl:value-of select="."/>
      </longitude_degrees>
   </xsl:template>

   <xsl:template match="longitudinal_hemisphere">
      <longitudinal_hemisphere>
         <xsl:value-of select="."/>
      </longitudinal_hemisphere>
  </xsl:template>

  <xsl:template match="latitude_minute_angular">
      <latitude_minute_angular>
         <xsl:value-of select="."/>
      </latitude_minute_angular>
   </xsl:template>

   <xsl:template match="longitude_minute_angular">
       <longitude_minute_angular>
          <xsl:value-of select="."/>
       </longitude_minute_angular>
   </xsl:template>


<xsl:template match="dmpi_lat_long_seconds">
   <dmpi_lat_long_minutes>
      <xsl:apply-templates/>
   </dmpi_lat_long_minutes>
</xsl:template>

   <xsl:template match="latitude_degrees">
```

```
    <latitude_degrees>
       <xsl:value-of select="."/>
    </latitude_degrees>
 </xsl:template>

 <xsl:template match="latitudinal_hemisphere">
    <latitudinal_hemisphere>
       <xsl:value-of select="."/>
    </latitudinal_hemisphere>
 </xsl:template>

 <xsl:template match="longitude_degrees">
    <longitude_degrees>
       <xsl:value-of select="."/>
    </longitude_degrees>
 </xsl:template>

 <xsl:template match="longitudinal_hemisphere">
    <longitudinal_hemisphere>
       <xsl:value-of select="."/>
  </longitudinal_hemisphere>
</xsl:template>

 <xsl:template match="latitude_minute_angular">
    <latitude_minute_angular>
       <xsl:value-of select="."/>
    </latitude_minute_angular>
 </xsl:template>

 <xsl:template match="longitude_minute_angular">
     <longitude_minute_angular>
        <xsl:value-of select="."/>
     </longitude_minute_angular>
 </xsl:template>

 <xsl:template match="latitude_seconds_angular">
     <latitude_seconds_angular>
        <xsl:value-of select="."/>
     </latitude_seconds_angular>
 </xsl:template>

 <xsl:template match="longitude_seconds_angular">
```

```
      <longitude_seconds_angular>
         <xsl:value-of select="."/>
      </longitude_seconds_angular>
   </xsl:template>


<xsl:template match="dmpi_lat_long_deciseconds">
   <dmpi_lat_long_deciseconds>
      <xsl:apply-templates/>
   </dmpi_lat_long_deciseconds>
</xsl:template>

   <xsl:template match="latitude_degrees">
      <latitude_degrees>
         <xsl:value-of select="."/>
      </latitude_degrees>
   </xsl:template>

   <xsl:template match="latitudinal_hemisphere">
      <latitudinal_hemisphere>
      <xsl:value-of select="."/>
   </latitudinal_hemisphere>
</xsl:template>

   <xsl:template match="longitude_degrees">
      <longitude_degrees>
         <xsl:value-of select="."/>
      </longitude_degrees>
   </xsl:template>

   <xsl:template match="longitudinal_hemisphere">
      <longitudinal_hemisphere>
         <xsl:value-of select="."/>
      </longitudinal_hemisphere>
   </xsl:template>

   <xsl:template match="latitude_minute_angular">
      <latitude_minute_angular>
         <xsl:value-of select="."/>
      </latitude_minute_angular>
   </xsl:template>
```

```
<xsl:template match="longitude_minute_angular">
    <longitude_minute_angular>
       <xsl:value-of select="."/>
    </longitude_minute_angular>
</xsl:template>

<xsl:template match="latitude_deciseconds_angular">
    <latitude_deciseconds_angular>
       <xsl:value-of select="."/>
    </latitude_deciseconds_angular>
</xsl:template>

<xsl:template match="longitude_deciseconds_angular">
    <longitude_deciseconds_angular>
       <xsl:value-of select="."/>
    </longitude_deciseconds_angular>
</xsl:template>


<xsl:template match="dmpi_lat_long_centiseconds">
 <dmpi_lat_long_centiseconds>
    <xsl:apply-templates/>
 </dmpi_lat_long_centiseconds>
</xsl:template>

<xsl:template match="latitude_degrees">
   <latitude_degrees>
      <xsl:value-of select="."/>
   </latitude_degrees>
</xsl:template>

<xsl:template match="latitudinal_hemisphere">
   <latitudinal_hemisphere>
      <xsl:value-of select="."/>
   </latitudinal_hemisphere>
</xsl:template>

<xsl:template match="longitude_degrees">
   <longitude_degrees>
      <xsl:value-of select="."/>
   </longitude_degrees>
</xsl:template>
```

```
   <xsl:template match="longitudinal_hemisphere">
      <longitudinal_hemisphere>
         <xsl:value-of select="."/>
      </longitudinal_hemisphere>
   </xsl:template>

   <xsl:template match="latitude_minute_angular">
      <latitude_minute_angular>
         <xsl:value-of select="."/>
      </latitude_minute_angular>
   </xsl:template>

   <xsl:template match="longitude_minute_angular">
       <longitude_minute_angular>
          <xsl:value-of select="."/>
       </longitude_minute_angular>
   </xsl:template>

   <xsl:template match="latitude_centiseconds_angular">
     <latitude_centiseconds_angular>
        <xsl:value-of select="."/>
     </latitude_centiseconds_angular>
   </xsl:template>

   <xsl:template match="longitude_centiseconds_angular">
       <longitude_centiseconds_angular>
          <xsl:value-of select="."/>
       </longitude_centiseconds_angular>
   </xsl:template>


<xsl:template match="dmpi_lat_long_thousandths_of_minute">
   <dmpi_lat_long_thousandths_of_minute>
      <xsl:apply-templates/>
   </dmpi_lat_long_thousandths_of_minute>
</xsl:template>

   <xsl:template match="latitude_degrees">
      <latitude_degrees>
         <xsl:value-of select="."/>
      </latitude_degrees>
```

```
</xsl:template>

<xsl:template match="latitude_minute_angular ">
   <latitude_minute_angular >
      <xsl:value-of select="."/>
   </latitude_minute_angular >
</xsl:template>

<xsl:template match="Decimal">
   <Decimal>
      <xsl:value-of select="."/>
   </Decimal>
</xsl:template>

<xsl:template match="thousandth_of_minute_of_latitude">
   <thousandth_of_minute_of_latitude>
      <xsl:value-of select="."/>
   </thousandth_of_minute_of_latitude>
</xsl:template>

<xsl:template match="latitudinal_hemisphere">
   <latitudinal_hemisphere>
      <xsl:value-of select="."/>
   </latitudinal_hemisphere>
</xsl:template>

<xsl:template match="longitude_degrees">
   <longitude_degrees>
      <xsl:value-of select="."/>
   </longitude_degrees>
</xsl:template>

<xsl:template match="longitude_minute_angular">
    <longitude_minute_angular>
       <xsl:value-of select="."/>
    </longitude_minute_angular>
</xsl:template>

<xsl:template match="Decimal">
   <Decimal>
      <xsl:value-of select="."/>
   </Decimal>
```

```
</xsl:template>

<xsl:template match="thousandth_of_minute_of_longitude">
    <thousandth_of_minute_of_longitude>
       <xsl:value-of select="."/>
    </thousandth_of_minute_of_longitude>
</xsl:template>

<xsl:template match="longitudinal_hemisphere">
   <longitudinal_hemisphere>
      <xsl:value-of select="."/>
   </longitudinal_hemisphere>
</xsl:template>


<xsl:template match="dmpi_lat_long_ten_thousandths_of_minute">
   <dmpi_lat_long_ten_thousandths_of_minute>
      <xsl:apply-templates/>
   </dmpi_lat_long_ten_thousandths_of_minute>
</xsl:template>

<xsl:template match="latitude_degrees">
   <latitude_degrees>
        <xsl:value-of select="."/>
     </latitude_degrees>
   </xsl:template>

   <xsl:template match="latitude_minute_angular ">
      <latitude_minute_angular >
         <xsl:value-of select="."/>
      </latitude_minute_angular >
   </xsl:template>

   <xsl:template match="Decimal">
      <Decimal>
         <xsl:value-of select="."/>
      </Decimal>
   </xsl:template>

   <xsl:template match="ten_thousandth_of_minute_of_latitude">
      <ten_thousandth_of_minute_of_latitude>
         <xsl:value-of select="."/>
```

```
   </ten_thousandth_of_minute_of_latitude>
</xsl:template>

<xsl:template match="latitudinal_hemisphere">
   <latitudinal_hemisphere>
      <xsl:value-of select="."/>
   </latitudinal_hemisphere>
</xsl:template>

<xsl:template match="longitude_degrees">
   <longitude_degrees>
      <xsl:value-of select="."/>
   </longitude_degrees>
</xsl:template>

<xsl:template match="longitude_minute_angular">
    <longitude_minute_angular>
       <xsl:value-of select="."/>
    </longitude_minute_angular>
</xsl:template>

<xsl:template match="Decimal">
  <Decimal>
      <xsl:value-of select="."/>
   </Decimal>
</xsl:template>

<xsl:template match="ten_thousandth_of_minute_of_longitude">
    <ten_thousandth_of_minute_of_longitude>
       <xsl:value-of select="."/>
    </ten_thousandth_of_minute_of_longitude>
</xsl:template>

<xsl:template match="longitudinal_hemisphere">
   <longitudinal_hemisphere>
      <xsl:value-of select="."/>
   </longitudinal_hemisphere>
</xsl:template>


<xsl:template match="dmpi_utm_1_meter  ">
  <dmpi_utm_1_meter  >
```

```
      <xsl:apply-templates/>
    </dmpi_utm_1_meter  >
  </xsl:template>

    <xsl:template match="utm_grid_zone_designation">
      <utm_grid_zone_designation>
        <xsl:value-of select="."/>
      </utm_grid_zone_designation>
    </xsl:template>

    <xsl:template match="utm_grid_zone_hemisphere">
      <utm_grid_zone_hemisphere>
        <xsl:value-of select="."/>
      </utm_grid_zone_hemisphere>
    </xsl:template>

    <xsl:template match="utm_grid_zone_row">
      <utm_grid_zone_row>
        <xsl:value-of select="."/>
      </utm_grid_zone_row>
  </xsl:template>

  <xsl:template match="utm_100000_meter_square_row">
      <utm_100000_meter_square_row>
        <xsl:value-of select="."/>
      </utm_100000_meter_square_row>
    </xsl:template>

    <xsl:template match="utm_1_meter_northing">
      <utm_1_meter_northing>
        <xsl:value-of select="."/>
      </utm_1_meter_northing>
    </xsl:template>

    <xsl:template match="utm_grid_zone_column">
      <utm_grid_zone_column>
        <xsl:value-of select="."/>
      </utm_grid_zone_column>
    </xsl:template>

    <xsl:template match="utm_100000_meter_square_column">
      <utm_100000_meter_square_column>
```

```
            <xsl:value-of select="."/>
         </utm_100000_meter_square_column>
      </xsl:template>

      <xsl:template match="utm_1_meter_easting">
         <utm_1_meter_easting>
            <xsl:value-of select="."/>
         </utm_1_meter_easting>
      </xsl:template>

</xsl:stylesheet>
```

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APPENDIX S. THREAT DATA DOCUMENT TYPE DEFINITION

```
<!-- Document Type Definition (DTD) for threat_data.  This DTD will be imported
in to the Master Operational Document (MOD) with the use of entities within the
MOD.

     Please note that the children of threat_location_utm_1_meter are not
defined within this DTD because they will be defined in the DTD for
unit_air_attack_plan.  The DTD for unit_air_attack_plan will also be imported
into the MOD.
-->


<!-- <!ELEMENT threat_data (threat*)> -->
   <!ELEMENT threat (threat_type, threat_position_and_elevation)>
       <!ELEMENT threat_type (#PCDATA)>
       <!ELEMENT threat_position_and_elevation (threat_location_utm_1_meter,
         threat_elevation_in_meters)>
       <!ELEMENT threat_location_utm_1_meter (utm_grid_zone_designation,
         utm_grid_zone_hemisphere, utm_grid_zone_row,
         utm_100000_meter_square_row, utm_1_meter_northing,
         utm_grid_zone_column, utm_100000_meter_square_column,
         utm_1_meter_easting)>
       <!-- utm_grid_zone_designation, utm_grid_zone_hemisphere,
         utm_grid_zone_column, utm_100000_meter_square_column,
         utm_1_meter_easting, utm_grid_zone_row, utm_100000_meter_square_row,
         utm_1_meter_northing are defined in the MOD -->
       <!ELEMENT threat_elevation_in_meters (#PCDATA)>
```

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APPENDIX T. THREAT DATA IN XML


```xml
<threat_data>
   <threat>
      <threat_type>Early_Warning_Radar</threat_type>
      <threat_position_and_elevation>
         <threat_location_utm_1_meter>
             <utm_grid_zone_designation>11</utm_grid_zone_designation>
             <utm_grid_zone_hemisphere>N</utm_grid_zone_hemisphere>
             <utm_grid_zone_row>39</utm_grid_zone_row>
             <utm_100000_meter_square_row>23</utm_100000_meter_square_row>
             <utm_1_meter_northing>200</utm_1_meter_northing>
             <utm_grid_zone_column>5</utm_grid_zone_column>
             <utm_100000_meter_square_column>36</utm_100000_meter_square_column>
             <utm_1_meter_easting>600</utm_1_meter_easting>
         </threat_location_utm_1_meter>
         <threat_elevation_in_meters>0</threat_elevation_in_meters>
      </threat_position_and_elevation>
 </threat>
 <threat>
     <threat_type>Early_Warning_Radar</threat_type>
      <threat_position_and_elevation>
         <threat_location_utm_1_meter>
             <utm_grid_zone_designation>11</utm_grid_zone_designation>
             <utm_grid_zone_hemisphere>N</utm_grid_zone_hemisphere>
             <utm_grid_zone_row>39</utm_grid_zone_row>
             <utm_100000_meter_square_row>28</utm_100000_meter_square_row>
             <utm_1_meter_northing>800</utm_1_meter_northing>
             <utm_grid_zone_column>5</utm_grid_zone_column>
             <utm_100000_meter_square_column>11</utm_100000_meter_square_column>
             <utm_1_meter_easting>300</utm_1_meter_easting>
         </threat_location_utm_1_meter>
         <threat_elevation_in_meters>0</threat_elevation_in_meters>
      </threat_position_and_elevation>
   </threat>
   <threat>
      <threat_type>SAM_Site</threat_type>
      <threat_position_and_elevation>
         <threat_location_utm_1_meter>
             <utm_grid_zone_designation>11</utm_grid_zone_designation>
             <utm_grid_zone_hemisphere>N</utm_grid_zone_hemisphere>
```

```
            <utm_grid_zone_row>39</utm_grid_zone_row>
            <utm_100000_meter_square_row>32</utm_100000_meter_square_row>
            <utm_1_meter_northing>400</utm_1_meter_northing>
            <utm_grid_zone_column>5</utm_grid_zone_column>
            <utm_100000_meter_square_column>09</utm_100000_meter_square_column>
            <utm_1_meter_easting>900</utm_1_meter_easting>
        </threat_location_utm_1_meter>
        <threat_elevation_in_meters>0</threat_elevation_in_meters>
    </threat_position_and_elevation>
</threat>
<threat>
    <threat_type>SAM_Site</threat_type>
    <threat_position_and_elevation>
        <threat_location_utm_1_meter>
            <utm_grid_zone_designation>11</utm_grid_zone_designation>
            <utm_grid_zone_hemisphere>N</utm_grid_zone_hemisphere>
            <utm_grid_zone_row>39</utm_grid_zone_row>
            <utm_100000_meter_square_row>31</utm_100000_meter_square_row>
            <utm_1_meter_northing>750</utm_1_meter_northing>
            <utm_grid_zone_column>5</utm_grid_zone_column>
          <utm_100000_meter_square_column>17</utm_100000_meter_square_column>
          <utm_1_meter_easting>400</utm_1_meter_easting>
     </threat_location_utm_1_meter>
        <threat_elevation_in_meters>0</threat_elevation_in_meters>
    </threat_position_and_elevation>
</threat>
<threat>
    <threat_type>SAM_Site</threat_type>
    <threat_position_and_elevation>
        <threat_location_utm_1_meter>
            <utm_grid_zone_designation>11</utm_grid_zone_designation>
            <utm_grid_zone_hemisphere>N</utm_grid_zone_hemisphere>
            <utm_grid_zone_row>39</utm_grid_zone_row>
            <utm_100000_meter_square_row>30</utm_100000_meter_square_row>
            <utm_1_meter_northing>750</utm_1_meter_northing>
            <utm_grid_zone_column>5</utm_grid_zone_column>
            <utm_100000_meter_square_column>22</utm_100000_meter_square_column>
            <utm_1_meter_easting>850</utm_1_meter_easting>
        </threat_location_utm_1_meter>
        <threat_elevation_in_meters>0</threat_elevation_in_meters>
    </threat_position_and_elevation>
</threat>
```

```
<threat>
   <threat_type>SAM_Site</threat_type>
   <threat_position_and_elevation>
      <threat_location_utm_1_meter>
          <utm_grid_zone_designation>11</utm_grid_zone_designation>
          <utm_grid_zone_hemisphere>N</utm_grid_zone_hemisphere>
          <utm_grid_zone_row>39</utm_grid_zone_row>
          <utm_100000_meter_square_row>25</utm_100000_meter_square_row>
          <utm_1_meter_northing>350</utm_1_meter_northing>
          <utm_grid_zone_column>5</utm_grid_zone_column>
          <utm_100000_meter_square_column>28</utm_100000_meter_square_column>
          <utm_1_meter_easting>600</utm_1_meter_easting>
      </threat_location_utm_1_meter>
      <threat_elevation_in_meters>0</threat_elevation_in_meters>
   </threat_position_and_elevation>
</threat>
<threat>
   <threat_type>SAM_Site</threat_type>
   <threat_position_and_elevation>
      <threat_location_utm_1_meter>
        <utm_grid_zone_designation>11</utm_grid_zone_designation>
        <utm_grid_zone_hemisphere>N</utm_grid_zone_hemisphere>
        <utm_grid_zone_row>39</utm_grid_zone_row>
          <utm_100000_meter_square_row>21</utm_100000_meter_square_row>
          <utm_1_meter_northing>400</utm_1_meter_northing>
          <utm_grid_zone_column>5</utm_grid_zone_column>
          <utm_100000_meter_square_column>37</utm_100000_meter_square_column>
          <utm_1_meter_easting>500</utm_1_meter_easting>
      </threat_location_utm_1_meter>
      <threat_elevation_in_meters>0</threat_elevation_in_meters>
   </threat_position_and_elevation>
</threat>
<threat>
   <threat_type>SAM_Site</threat_type>
   <threat_position_and_elevation>
      <threat_location_utm_1_meter>
          <utm_grid_zone_designation>11</utm_grid_zone_designation>
          <utm_grid_zone_hemisphere>N</utm_grid_zone_hemisphere>
          <utm_grid_zone_row>39</utm_grid_zone_row>
          <utm_100000_meter_square_row>24</utm_100000_meter_square_row>
          <utm_1_meter_northing>700</utm_1_meter_northing>
          <utm_grid_zone_column>5</utm_grid_zone_column>
```

```
            <utm_100000_meter_square_column>42</utm_100000_meter_square_column>
            <utm_1_meter_easting>150</utm_1_meter_easting>
         </threat_location_utm_1_meter>
         <threat_elevation_in_meters>0</threat_elevation_in_meters>
      </threat_position_and_elevation>
   </threat>
   <threat>
      <threat_type>SAM_Site</threat_type>
      <threat_position_and_elevation>
         <threat_location_utm_1_meter>
            <utm_grid_zone_designation>11</utm_grid_zone_designation>
            <utm_grid_zone_hemisphere>N</utm_grid_zone_hemisphere>
            <utm_grid_zone_row>39</utm_grid_zone_row>
            <utm_100000_meter_square_row>19</utm_100000_meter_square_row>
            <utm_1_meter_northing>600</utm_1_meter_northing>
            <utm_grid_zone_column>5</utm_grid_zone_column>
            <utm_100000_meter_square_column>46</utm_100000_meter_square_column>
            <utm_1_meter_easting>800</utm_1_meter_easting>
         </threat_location_utm_1_meter>
         <threat_elevation_in_meters>0</threat_elevation_in_meters>
      </threat_position_and_elevation>
   </threat>
   <threat>
      <threat_type>SAM_Site</threat_type>
      <threat_position_and_elevation>
         <threat_location_utm_1_meter>
            <utm_grid_zone_designation>11</utm_grid_zone_designation>
            <utm_grid_zone_hemisphere>N</utm_grid_zone_hemisphere>
            <utm_grid_zone_row>39</utm_grid_zone_row>
            <utm_100000_meter_square_row>17</utm_100000_meter_square_row>
            <utm_1_meter_northing>900</utm_1_meter_northing>
            <utm_grid_zone_column>5</utm_grid_zone_column>
            <utm_100000_meter_square_column>55</utm_100000_meter_square_column>
            <utm_1_meter_easting>600</utm_1_meter_easting>
         </threat_location_utm_1_meter>
         <threat_elevation_in_meters>0</threat_elevation_in_meters>
      </threat_position_and_elevation>
   </threat>
   <threat>
      <threat_type>SAM_Site</threat_type>
      <threat_position_and_elevation>
         <threat_location_utm_1_meter>
```

```
            <utm_grid_zone_designation>11</utm_grid_zone_designation>
            <utm_grid_zone_hemisphere>N</utm_grid_zone_hemisphere>
            <utm_grid_zone_row>39</utm_grid_zone_row>
            <utm_100000_meter_square_row>32</utm_100000_meter_square_row>
            <utm_1_meter_northing>100</utm_1_meter_northing>
            <utm_grid_zone_column>5</utm_grid_zone_column>
            <utm_100000_meter_square_column>40</utm_100000_meter_square_column>
            <utm_1_meter_easting>800</utm_1_meter_easting>
         </threat_location_utm_1_meter>
         <threat_elevation_in_meters>0</threat_elevation_in_meters>
      </threat_position_and_elevation>
   </threat>
   <threat>
      <threat_type>SAM_Site</threat_type>
      <threat_position_and_elevation>
         <threat_location_utm_1_meter>
            <utm_grid_zone_designation>11</utm_grid_zone_designation>
            <utm_grid_zone_hemisphere>N</utm_grid_zone_hemisphere>
            <utm_grid_zone_row>39</utm_grid_zone_row>
            <utm_100000_meter_square_row>38</utm_100000_meter_square_row>
          <utm_1_meter_northing>200</utm_1_meter_northing>
          <utm_grid_zone_column>5</utm_grid_zone_column>
          <utm_100000_meter_square_column>37</utm_100000_meter_square_column>
            <utm_1_meter_easting>550</utm_1_meter_easting>
         </threat_location_utm_1_meter>
         <threat_elevation_in_meters>0</threat_elevation_in_meters>
      </threat_position_and_elevation>
   </threat>
   <threat>
      <threat_type>SAM_Site</threat_type>
      <threat_position_and_elevation>
         <threat_location_utm_1_meter>
            <utm_grid_zone_designation>11</utm_grid_zone_designation>
            <utm_grid_zone_hemisphere>N</utm_grid_zone_hemisphere>
            <utm_grid_zone_row>39</utm_grid_zone_row>
            <utm_100000_meter_square_row>37</utm_100000_meter_square_row>
            <utm_1_meter_northing>000</utm_1_meter_northing>
            <utm_grid_zone_column>5</utm_grid_zone_column>
            <utm_100000_meter_square_column>29</utm_100000_meter_square_column>
            <utm_1_meter_easting>000</utm_1_meter_easting>
         </threat_location_utm_1_meter>
         <threat_elevation_in_meters>0</threat_elevation_in_meters>
```

```
      </threat_position_and_elevation>
    </threat>
    <threat>
      <threat_type>SAM_Site</threat_type>
      <threat_position_and_elevation>
        <threat_location_utm_1_meter>
            <utm_grid_zone_designation>11</utm_grid_zone_designation>
            <utm_grid_zone_hemisphere>N</utm_grid_zone_hemisphere>
            <utm_grid_zone_row>39</utm_grid_zone_row>
            <utm_100000_meter_square_row>40</utm_100000_meter_square_row>
            <utm_1_meter_northing>600</utm_1_meter_northing>
            <utm_grid_zone_column>5</utm_grid_zone_column>
            <utm_100000_meter_square_column>21</utm_100000_meter_square_column>
            <utm_1_meter_easting>650</utm_1_meter_easting>
        </threat_location_utm_1_meter>
        <threat_elevation_in_meters>0</threat_elevation_in_meters>
      </threat_position_and_elevation>
    </threat>
    <threat>
      <threat_type>SAM_Site</threat_type>
    <threat_position_and_elevation>
      <threat_location_utm_1_meter>
          <utm_grid_zone_designation>11</utm_grid_zone_designation>
            <utm_grid_zone_hemisphere>N</utm_grid_zone_hemisphere>
            <utm_grid_zone_row>39</utm_grid_zone_row>
            <utm_100000_meter_square_row>45</utm_100000_meter_square_row>
            <utm_1_meter_northing>500</utm_1_meter_northing>
            <utm_grid_zone_column>5</utm_grid_zone_column>
            <utm_100000_meter_square_column>26</utm_100000_meter_square_column>
            <utm_1_meter_easting>650</utm_1_meter_easting>
        </threat_location_utm_1_meter>
        <threat_elevation_in_meters_in_meters>0</threat_elevation_in_meters_in_meters>
      </threat_position_and_elevation>
    </threat>
  </threat_data>
```

APPENDIX U. TERRAIN DATA DOCUMENT TYPE DEFINITION

```
<!ELEMENT geo_Origin_utm_1_meter (utm_grid_zone_designation,
  utm_grid_zone_hemisphere, utm_grid_zone_row, utm_100000_meter_square_row,
  utm_1_meter_northing, utm_grid_zone_column, utm_100000_meter_square_column,
  utm_1_meter_easting)>
```

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APPENDIX V. TERRAIN DATA IN XML


```
<terrain_data>
   <geo_Origin_utm_1_meter>
      <utm_grid_zone_designation>11</utm_grid_zone_designation>
      <utm_grid_zone_hemisphere>N</utm_grid_zone_hemisphere>
      <utm_grid_zone_row>39</utm_grid_zone_row>
      <utm_100000_meter_square_row>03</utm_100000_meter_square_row>
      <utm_1_meter_northing>000</utm_1_meter_northing>
      <utm_grid_zone_column>5</utm_grid_zone_column>
      <utm_100000_meter_square_column>33</utm_100000_meter_square_column>
      <utm_1_meter_easting>000</utm_1_meter_easting>
   </geo_Origin_utm_1_meter>
</terrain_data>
```

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APPENDIX W. MASTER OPERATION DOCUMENT IN XML

```
<?xml version="1.0" standalone="no"?>

<?xml-stylesheet type="text/xsl" href="MOD_to_VRML.xsl"?>
  <!-- The Above Stylesheet converts XML data about an air plan to Virtual Reality Markup Language -->


<!-- Master Operational Document (MOD) -->

<!DOCTYPE MOD [
   <!ELEMENT MOD (terrain_data, ato_header_data, unit_air_attack_plan*, threat_data)>


         <!ELEMENT terrain_data (geo_Origin_utm_1_meter)>
         <!ENTITY % terrain_entity SYSTEM "terrain_data.dtd">
         %terrain_entity;

          <!ELEMENT ato_header_data (operation_identification_data?, exercise_identification?,
            message_identification?,  effective_day_time_frame)>
          <!ENTITY % ato_header_data_entity SYSTEM "ato_header_data.dtd">
          %ato_header_data_entity;


         <!ELEMENT unit_air_attack_plan (country_of_the_world, tasked_service, tasked_unit_and_location,
          aircraft_mission_data_segment)>
         <!ENTITY % unit_air_attack_plan_entity SYSTEM "unit_air_attack_plan.dtd">
         %unit_air_attack_plan_entity;

         <!ELEMENT threat_data (threat*)>
         <!ENTITY % threat_data_entity SYSTEM "threat_data.dtd">
         %threat_data_entity;


<!-- External General Entity Definitions for XML Data -->

  <!ENTITY terrain_data_XML SYSTEM "terrain_data.xml">
  <!ENTITY ato_header_data_XML SYSTEM "ato_header_data.xml">
  <!ENTITY air_plan_101AIRCAV_XML SYSTEM "101AIRCAV_air_plan.xml">
  <!ENTITY air_plan_100TFW_XML SYSTEM "100TFW_air_plan.xml">
  <!ENTITY air_plan_4TFW_XML SYSTEM "4TFW_air_plan.xml">
```

```xml
  <!ENTITY threat_data_XML SYSTEM "threat_data.xml">
]>

<MOD>

&terrain_data_XML;          <!-- External General Entity Call for data -->
&ato_header_data_XML;       <!-- External General Entity Call for data -->
&air_plan_101AIRCAV_XML;    <!-- External General Entity Call for data -->
&air_plan_100TFW_XML;       <!-- External General Entity Call for data -->
&air_plan_4TFW_XML;         <!-- External General Entity Call for data -->
&threat_data_XML;           <!-- External General Entity Call for data -->

</MOD>
```

APPENDIX X. MASTER OPERATION DOCUMENT TO VRML AIR PLAN STYLESHEET

```
<?xml version="1.0"?>
<!-- <xsl:stylesheet xmlns:xsl="http://www.w3.org/TR/WD-xsl"> --> <!-- Microsoft reference call -->

<xsl:stylesheet xmlns:xsl="http://www.w3.org/1999/XSL/Transform" version="1.0"
                xmlns:saxon="http://icl.com/saxon" saxon:trace="no">   <!-- SAXON reference call -->

<xsl:output method="text"/>
<xsl:strip-space elements="*"/>

<!-- XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX -->
<!-- This style sheet is used to convert the Master Operational Document's air attack plan in XML
     to air attack plan in the Virtual Reality Modeling Language, which can be displayed in a
     VRML compliant browser (i.e. Cosmos)

  Invocation:  saxon -o

  The style sheet user(s) will be the caretaker(s) of the MOD.                                   -->
<!-XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX -->


<xsl:template match="MOD">
<xsl:text disable-output-escaping="yes">#VRML V2.0 utf8

WorldInfo {
  title "Air Attack Plan"

  info [ "This is a 3-D Air Attack Plan Autogenerated from an Air Tasking Order in the XML data format",
            "This world was developed by Mark Murray and Jason Quigley" ]
          }


EXTERNPROTO Terrain [
               field        SFNode   geoOrigin

             ] "FortIrwinTerrain.wrl#Terrain"

EXTERNPROTO F15 [ ] "F-15_PROTO.wrl#F-15"
```

```
#Not Yet implemented in final World
EXTERNPROTO SAM_Site [ ] "Targets.wrl#SAM_Site"

#Not yet implemented in final world
EXTERNPROTO Early_Warning_Radar [ ] "Targets.wrl#Early_Warning_Radar"

#Currently Named Apache in XML need to change

#EXTERNPROTO AH-64 [ ] "AH-64_PROTO.wrl#AH-64"

# Needs to be renamed to AH-64
EXTERNPROTO APACHE [ ] "AH-64_PROTO.wrl#AH-64"


EXTERNPROTO geoOrigin [
  exposedField MFString     geoSystem
  exposedField SFString     geoCoords
  field        SFBool    rotateYUp
  ]["C:\geovrml\protos\geoOrigin.wrl"]

EXTERNPROTO GeoViewpoint [
   field         SFNode     geoOrigin
  field         MFString   geoSystem
  field         SFString   position
  field         SFRotation orientation
  field         SFString   description
  exposedField SFFloat    fieldOfView
  exposedField SFBool     jump
  exposedField MFString   navType
  eventIn       SFBool     set_bind
  eventIn       SFString   set_position
  eventOut      SFTime     bindTime
  eventOut      SFBool     isBound
] "C:\geovrml\protos\GeoViewpoint.wrl"


EXTERNPROTO Aircraft [

  field SFNode     geoOrigin
  field MFString   geoSystem
  field              MFNode      AircraftType
```

```
  exposedField        SFString   CallSign
  exposedField        SFString   Mission
  exposedField        SFString   MissionNumber
  field         SFString   TakeoffPosition
  field         MFString   WayPoints
  field         MFFloat    WayPointTime
        ] "Aircraft_PROTO.wrl#Aircraft"

EXTERNPROTO Target [
  field         SFNode     geoOrigin
  field         MFString     geoSystem
  field         MFNode     TargetType
  field         SFString      CallSign
  field         MFString      TargetPosition
  ]["...\....\protos\aircraft.wrl"]



#Begin SCENE GRAPH
 #--The geoOrgin Node can be the first coord we come across or Hardwired in
 #--I need to add a geo View Point node to the world
 #--A terrain Node Still Needs to be added to the world.
#--Currently the display node is imbedded in the Protos
#--it may be more efficient to place display node in main world


DEF AirPlan_Origin geoOrigin {
        geoSystem ["UTM" "Z11"]
        geoCoords "3905500 559000 0"
        }

GeoViewpoint {
        geoOrigin USE AirPlan_Origin
        geoSystem ["UTM" "Z11"]
        position "3905500 559000 40000"
        navType   ["FLY"]
        }

</xsl:text>
  <xsl:apply-templates/>
</xsl:template>
```

```
<xsl:template match="terrain_data"/>
  <xsl:template match="geo_Origin"/>
     <xsl:template match="utm_grid_zone_designation"/>
     <xsl:template match="utm_grid_zone_hemisphere"/>
        <xsl:template match="utm_grid_zone_column"/>
        <xsl:template match="utm_100000_meter_square_row"/>
        <xsl:template match="utm_grid_zone_column"/>
        <xsl:template match="utm_1_meter_northing"/>
        <xsl:template match="utm_100000_meter_square_column"/>
        <xsl:template match="utm_1_meter_easting"/>
        <xsl:template match="utm_grid_zone_row"/>


<xsl:template match="ato_header_data">
    <xsl:apply-templates/>
</xsl:template>

  <xsl:template match="operation_identification_data"/>
  <xsl:template match="exercise_identification"/>
<xsl:template match="message_identification"/>
<xsl:template match="effective_day_time_frame"/>

<xsl:template match="unit_air_attack_plan">
   <xsl:apply-templates/>
</xsl:template>

   <xsl:template match="country_of_the_world"/>
   <xsl:template match="tasked_service"/>

   <xsl:template match="tasked_unit_and_location">
     <xsl:apply-templates/>
   </xsl:template>
      <xsl:template match="tasked_unit_designator"/>
      <xsl:template match="tasked_unit_location_taskunit"/>
         <xsl:template match="icao_base_name"/>
         <xsl:template match="place_name"/>
         <xsl:template match="geographic_location_lat_long_minutes"/>

      <xsl:template match="aircraft_mission_data_segment">
         <xsl:text disable-output-escaping="yes">Aircraft {
</xsl:text>
```

```
          <xsl:text disable-output-escaping="yes">geoOrigin USE AirPlan_Origin
</xsl:text>
          <xsl:text disable-output-escaping="yes">geoSystem ["UTM", "Z"]
</xsl:text>
        <xsl:apply-templates/>
        <xsl:text disable-output-escaping="yes">
}
</xsl:text>
      </xsl:template>

        <xsl:template match="individual_aircraft_mission_data">
           <xsl:apply-templates/>
        </xsl:template>

           <xsl:template match="number_of_aircraft">
              <xsl:apply-templates select="xxx" mode="xxx"/>
           </xsl:template>

           <xsl:template match="type_of_aircraft">
              <xsl:text disable-output-escaping="yes">
    AircraftType </xsl:text><xsl:text disable-output-escaping="yes">[</xsl:text>
            <xsl:value-of select="aircraft_type_and_model | aircraft_type_and_model_other"/>
            <xsl:text disable-output-escaping="yes">{} ]</xsl:text><xsl:text disable-output-escaping="yes">
         </xsl:text>
        </xsl:template>

        <xsl:template match="aircraft_call_sign">
           <xsl:text disable-output-escaping="yes">CallSign </xsl:text><xsl:text>&quot;</xsl:text><xsl:value-of
select="."/><xsl:text disable-output-escaping="yes">&quot;</xsl:text>
        </xsl:template>

        <xsl:template match="primary_configuration_code"/>
        <xsl:template match="secondary_configuration_code"/>

        <xsl:template match="mission_number">
           <xsl:text disable-output-escaping="yes">
        MissionNumber </xsl:text><xsl:text>&quot;</xsl:text><xsl:value-of select="."/><xsl:text disable-output-
escaping="yes">&quot;</xsl:text>
        </xsl:template>

        <xsl:template match="primary_mission_type">
           <xsl:text disable-output-escaping="yes">
```

```
        Mission </xsl:text><xsl:text>&quot;</xsl:text><xsl:value-of select="."/><xsl:text disable-output-
escaping="yes">&quot;</xsl:text>
        </xsl:template>

     <xsl:template match="ground_target_location"/>
        <xsl:template match="target_type"/>
        <xsl:template match="target_priority"/>
        <xsl:template match="time_on_target_gtgtloc"/>
        <xsl:template match="desired_mean_point_of_impact_gtgtloc"/>

     <xsl:template match="mission_routing_data">
        <xsl:apply-templates/>
     </xsl:template>

        <xsl:template match="day_time_and_month_of_start"/>
        <xsl:template match="day_time_and_month_of_stop"/>

        <xsl:template match="takeoff_position">
                <xsl:text disable-output-escaping="yes">
        TakeoffPosition </xsl:text><xsl:text>&quot;</xsl:text>
    <xsl:apply-templates/>
    <xsl:text>&quot;</xsl:text><xsl:text> </xsl:text>
     </xsl:template>

           <xsl:template match="takeoff_position_utm_1_meter">
              <xsl:apply-templates/>
           </xsl:template>

                <xsl:template match="utm_100000_meter_square_row">
                   <xsl:value-of select="."/>
                </xsl:template>

                <xsl:template match="utm_grid_zone_row">
                  <xsl:value-of select="."/>
                </xsl:template>

                <xsl:template match="utm_grid_zone_column">
                   <xsl:value-of select="utm_1_meter_northing"/><xsl:text> </xsl:text>
                </xsl:template>

                <xsl:template match="utm_1_meter_northing">
                   <xsl:value-of select="."/><xsl:text> </xsl:text>
```

```
</xsl:template>

<xsl:template match="utm_grid_zone_column">
  <xsl:value-of select="."/>
</xsl:template>

<xsl:template match="utm_100000_meter_square_column">
   <xsl:value-of select="."/>
</xsl:template>

<xsl:template match="utm_1_meter_easting">
   <xsl:value-of select="."/><xsl:text> </xsl:text>
</xsl:template>

   <xsl:template match="takeoff_elevation_in_meters">
       <xsl:value-of select="."/>
   </xsl:template>


  <xsl:template match="route_field_group">
   <xsl:apply-templates/>
 </xsl:template>

    <xsl:template match="route_point_route">
        <xsl:text disable-output-escaping="yes">
WayPoints[</xsl:text><xsl:apply-templates/><xsl:text disable-output-escaping="yes">]</xsl:text>
    </xsl:template>

        <xsl:template match="point_and_altitude">
           <xsl:text>&quot;</xsl:text><xsl:apply-templates/><xsl:text>&quot;</xsl:text><xsl:text
disable-output-escaping="yes">
                 </xsl:text>
        </xsl:template>

           <xsl:template match="route_point_utm_1_meter">
              <xsl:apply-templates/>
           </xsl:template>

              <xsl:template match="utm_grid_zone_designation"/>
              <xsl:template match="utm_grid_zone_hemisphere"/>

              <xsl:template match="utm_grid_zone_row">
```

```
    <xsl:value-of select="."/>
  </xsl:template>

  <xsl:template match="utm_100000_meter_square_row">
    <xsl:value-of select="."/>
  </xsl:template>

  <xsl:template match="utm_grid_zone_column">
    <xsl:value-of select="utm_1_meter_northing"/><xsl:text> </xsl:text>
  </xsl:template>

  <xsl:template match="utm_1_meter_northing">
    <xsl:value-of select="."/><xsl:text> </xsl:text>
  </xsl:template>

  <xsl:template match="utm_grid_zone_column">
     <xsl:value-of select="."/>
  </xsl:template>

  <xsl:template match="utm_100000_meter_square_column">
  <xsl:value-of select="."/>
</xsl:template>

  <xsl:template match="utm_1_meter_easting">
    <xsl:value-of select="."/><xsl:text> </xsl:text>
  </xsl:template>

<xsl:template match="route_point_altitude_in_meters">
  <xsl:value-of select="."/>
</xsl:template>

<xsl:template match="time_of_position_route">
    <xsl:text disable-output-escaping="yes">
WayPointTime[</xsl:text><xsl:apply-templates/><xsl:text disable-output-escaping="yes">]</xsl:text>
</xsl:template>

  <xsl:template match="cumulative_ato_time_in_seconds">
    <xsl:value-of select=". div 12 div 3600"/><xsl:text> </xsl:text><xsl:text disable-output-
         escaping="yes">
                </xsl:text>
  </xsl:template>
```

```
  <xsl:template match="threat_data">
        <xsl:apply-templates/>
  </xsl:template>

       <xsl:template match="threat">
          <xsl:text disable-output-escaping="yes">
Target {
geoOrigin USE AirPlan_Origin
geoSystem ["UTM", "Z"]</xsl:text>
          <xsl:apply-templates/>
          <xsl:text disable-output-escaping="yes">
}
</xsl:text>
       </xsl:template>

          <xsl:template match="threat_type">
             <xsl:text disable-output-escaping="yes">
TargetType </xsl:text><xsl:text disable-output-escaping="yes">[</xsl:text><xsl:value-of select="."/>
           <xsl:text disable-output-escaping="yes">{} ]</xsl:text>
          </xsl:template>

        <xsl:template match="threat_position_and_elevation">
          <xsl:text disable-output-escaping="yes">
TargetPosition </xsl:text><xsl:text>&quot;</xsl:text><xsl:apply-templates/><xsl:text>&quot;</xsl:text>
          </xsl:template>

             <xsl:template match="threat_location_utm_1_meter">
                <xsl:apply-templates/>
             </xsl:template>

<!--                  <xsl:template match="utm_grid_zone_designation"/>
                  <xsl:template match="utm_grid_zone_hemisphere"/>
-->

                   <xsl:template match="utm_grid_zone_row">
                      <xsl:value-of select="."/>
                   </xsl:template>

                   <xsl:template match="utm_100000_meter_square_row">
                      <xsl:value-of select="."/>
                   </xsl:template>
```

```
    <xsl:template match="utm_1_meter_northing">
       <xsl:value-of select="."/><xsl:text> </xsl:text>
    </xsl:template>

    <xsl:template match="utm_grid_zone_column">
       <xsl:value-of select="."/>
    </xsl:template>

    <xsl:template match="utm_100000_meter_square_column">
       <xsl:value-of select="."/>
    </xsl:template>

    <xsl:template match="utm_1_meter_easting">
       <xsl:value-of select="."/><xsl:text> </xsl:text>
    </xsl:template>

  <xsl:template match="threat_elevation">
      <xsl:value-of select="."/>
  </xsl:template>
</xsl:stylesheet>
```

APPENDIX Y. VRML AIR PLAN

```
#VRML V2.0 utf8

WorldInfo {
info [ "This is a 3-D Air Attack Plan Autogenerated By XSL",
       "This world was Developed by Mark Murray and Jason Quigley",
       "NPS Thesis June 2000" ]
title "Air Attack Plan"
}

EXTERNPROTO Master [exposedField SFTime        cycleInterval
                    field      SFFloat     time_hold
                    field      SFFloat     run_time
                    eventOut   SFFloat     fraction_changed
                  ]["MasterControl_PROTO.wrl#Master_Control"]

#--Aircraft Library *--* Needs to be replaced in future with better method of
calling

EXTERNPROTO F15 [
                field SFString Top_Description
               ]["Aircraft\F-15\F-15_PROTO.wrl#F-15"]

# EXTERNPROTO AH-64 [
#               field SFString Top_Description ] "Aircraft\AH-64\AH-
64_PROTO.wrl#AH-64"
#Currently Named Apache in XML need to change to AH-64

EXTERNPROTO APACHE [
                field SFString Top_Description
                 ]["Aircraft\Ah-64\AH-64_PROTO.wrl#AH-64"]


#--Target Library *--* Needs to be replaced in future with better method of
calling

EXTERNPROTO SAM_Site [ ] ["Target\Target_lib.wrl#SAM_Site"]

EXTERNPROTO Early_Warning_Radar [ ]
["Target\Target_Lib.wrl#Early_Warning_Radar"]


#--Terrain PROTO called *--* Currently only Ft. Irwin Terrain Available

EXTERNPROTO Terrain [
                    field       SFNode   geoOrigin

                  ]["Terrain\FortIrwinTerrain.wrl#Terrain"]



#--GeoVRML Nodes referenced for use by Aircraft PROTO

EXTERNPROTO geoOrigin [
                    exposedField MFString     geoSystem
                    exposedField SFString     geoCoords
                    field        SFBool rotateYUp
                   ]["GeoVRML\geoOrigin.wrl"]
```

```
EXTERNPROTO Target [
                    field       SFNode   geoOrigin
                    field        MFString      geoSystem
                    field        MFNode TargetType
                    field        SFString      CallSign
                    field        SFString      TargetPosition
                 ]["Target\Target_PROTO.wrl#Target"]

EXTERNPROTO Aircraft [

                    field       SFNode   geoOrigin
                    field       MFString geoSystem
                    field       MFNode   AircraftType
                    field       SFString AircraftName
                    field       SFString CallSign
                    field       SFString Mission
                    field       SFString MissionNumber
                    field       SFString TakeoffPosition
                    field       MFString WayPoints
                    field       MFFloat  WayPointTime
                    eventIn           SFFloat  set_fraction
                 ]["Aircraft\Aircraft_PROTO.wrl#Aircraft"]


#Begin SCENE GRAPH
#--The geoOrgin Node can be the first coord we come across or Hardwired in
#--I need to add a geo View Point node to the world
#--A terrain Node Still Needs to be added to the world.
#--Currently the display node is imbedded in the Protos
#--it may be more efficient to place display node in main world


Group {

   children [

# Should autogenerate data in future upgrades
       DEF Master_Control Master {cycleInterval 300
                             time_hold 300
                             run_time 4932}

       DEF AirPlan_Origin  geoOrigin {
                                  geoSystem ["UTM" ,"Z11"]
                                  geoCoords "3905500 578200 0"
                                  rotateYUp FALSE
                                 }


       Terrain {

                    geoOrigin USE AirPlan_Origin
              }



DEF EARLYBIRD1
Aircraft {
             geoOrigin USE AirPlan_Origin
             geoSystem ["UTM", "Z11"]
             AircraftName "APACHE"
```

```
AircraftType [ APACHE {Top_Description "**EARLYBIRD1**"} ]
CallSign "EARLYBIRD1"
MissionNumber "EWRADAR01"
Mission "INT"
TakeoffPosition "3905500 559000 0"
WayPoints["3905500 559000 3174"
          "3905500 559000 3183"
          "3906000 559000 3189"
          "3908000 559000 3204"
          "3912000 559000 3210"
          "3913000 559000 3218"
          "3914000 559000 3224"
          "3915000 559000 3232"
          "3916000 559000 3241"
          "3915000 559000 3250"
          "3918000 559000 3256"
          "3919000 559000 3271"
          "3920000 559000 3284"
          "3921000 558000 3299"
          "3922200 557000 3314"
          "3923000 556000 3323"
          "3924000 555000 3329"
          "3925000 554000 3338"
          "3926000 552000 3348"
          "3927000 550000 3352"
          "3928000 549000 3358"
          "3928000 548000 3340"
          "3928000 547000 3335"
          "3928000 546000 3332"
          "3928000 540000 3328"
          "3928000 537000 3332"
          "3927000 537000 3341"
          "3927000 533000 3348"
          "3927000 532000 3375"
          "3927000 531000 3384"
          "3927000 530000 3375"
          "3927000 529000 3354"
          "3927000 526000 3354"
          "3927000 524000 3366"
          "3927000 523000 3357"
          "3927000 522000 3314"
          "3928000 520000 3314"
          "3929000 518000 3332"
          "3930000 517500 3341"
          "3930000 516000 3351"
          "3930000 515000 3363"
          "3930000 514000 3369"
          "3930000 513000 3381"
          "3930000 512000 3387"
          "3929500 511500 3430"
          "3929000 511500 3448"
          "3929000 511500 3448"
          "3905500 559000 3000"
          ]
WayPointTime[0

0.00202757502027575009506676906312350183725357055664062 5

0.005829278183292780468605087662581354379653930664062 5

0.02103609083536090551547204086091369390487670898437 5
```

0.05144971613949715916191962605807930231094360351562 5
0.0590531224655312314553157193586230278015136718 75

0.06665855636658556626628069352591410279273986816406 25

0.0742619626926196207961083928239531815052032470703125

0.0818653690186536842077202891232445836067199707031 25

0.08946877534468775650111638242378830909729003906 25

0.09707218167072182879451247572433203458786010742187 5

0.10467558799675584779720338701736181974411010742187 5

0.11228102189781019593084465668653137981891632080078125

0.12303325223033250157556039994233287870883941650390625

0.1337875101378751097058739105705171823501586914062 5

0.1445397404703973975870212598238140344619750976562 5

0.1552939983779399746310900809476152062416076660156 25

0.1660462287104622802758058242034167051315307617187 5

0.18304744525547443245727663452271372079849243164062 5

0.20005068937550687380166891671251505613327026367187 5
0.2108029197080291794463846599683165550231933593 75

0.218408353609083549784486422140616923570632934570312 5
0.2260117599351175954325299244374036788940429687 5

0.23361516626115164108057342673419043421745300292968 75

0.2792356042173560481955973955336958169937133789062 5

0.30204582319545818513972790242405608296394348144531 25

0.30964922952149227519669238972710445523262023925781 25

0.34006285482562854660670836892677471041679382324218 75

0.34766828872668287253588914609281346201896667480468 75

0.3552737226277371540561489382525905966758728027343 75

0.36287712895377128852203441056190058588981628417968 75

0.37048256285482561445121518772793933749198913574218 75

0.3932927818329278402131876646308228373527526855468 75

0.4084995944849959315092746692243963479995727539062 5

0.41610300081102993274839718651492148637771606445312 5

0.4237124898621248192398525134194642305374145507812 5
0.440715733982157331638518371619284152984619140625

```
0.457716950527169519347125969943590462207794189453125

0.466218572587185686728616929030977189540863037109375

0.477623682076236732996221689973026514053344726562 5
                              0.485227088402270823053186177276074886322021484375

0.492830494728304913110150664579123258590698242187 5
                              0.500435928629359239039331441745162010192871093 75

0.508039334955393329096295929048210382461547851562 5

0.513424574209245676570390060078352689743041992187 5
                              0.517230332522303370978988823480904102325439453125

0.590223033252223033354518520354758948087692260742187 5
                              0.993171127331711289798477082513272762298583984375
                              ]
}
DEF EARLYBIRD2
Aircraft {
         geoOrigin USE AirPlan_Origin
         geoSystem ["UTM", "Z11"]
         AircraftName "APACHE"
         AircraftType [ APACHE {Top_Description "**EARLYBIRD2**"} ]
         CallSign "EARLYBIRD2"
         MissionNumber "EWRADAR02"
         Mission "INT"
         TakeoffPosition "3905500 559000 0"
         WayPoints["3905500 559000 3174"
                  "3905500 559000 3183"
                  "3906000 559000 3189"
                  "3908000 559000 3204"
                  "3912000 559000 3210"
                  "3913000 559000 3218"
                  "3914000 559000 3224"
                  "3915000 559000 3232"
                  "3916000 559000 3241"
                  "3915000 559000 3250"
                  "3918000 559000 3256"
                  "3919000 559000 3271"
                  "3920000 559000 3284"
                  "3921000 558000 3299"
                  "3922200 557000 3314"
                  "3923000 556000 3323"
                  "3924000 555000 3329"
                  "3925000 554000 3338"
                  "3926000 552000 3348"
                  "3927000 550000 3352"
                  "3928000 549000 3358"
                  "3928000 548000 3340"
                  "3928000 547000 3335"
                  "3928000 546000 3332"
                  "3928000 540000 3328"
                  "3928000 537000 3332"
                  "3927000 537000 3341"
                  "3926000 537000 3357"
                  "3925500 537000 3369"
                  "3925000 537000 3387"
                  "3924600 537000 3412"
                  "3924400 537000 3430"
```

```
"3924000 536500 3491"
"3923500 536500 3509"
"3923500 536500 3509"
"3905500 559000 3000"
]

WayPointTime[0.1793248175182481585210325647494755685329437255859375
    0.181352392538523901066582766361534595489501953125

0.185154095701540928331496616010554134845733642578125

0.2003609083536090462729362116078846156597137451171875

0.2307745336577453176829521908075548708438873291015625

0.2383779399837794077399166781106032431125640869140625

0.24598134630981345338796018040738999843597412109375

0.25358678021086777931714095757342875003814697265625

0.26119018653690186937410544487647712230682373046875

0.2687935928629359150221489471732638776302337646484375

0.276396999188969960670192449470050632953643798828125

0.284000405515004050727156936773099005222320556640625

0.291605839416058376656337713939137756824493408203125

0.3023580697485806378921324721886776387691497802734375

0.313112327656123223817985490313731133937835693359375

0.3238645579886455294627012335695326328277587890625

0.33461881589618815979747523670084774494171142578125

0.34537104622871037662434900994412600994110107421875

0.362372262773722564332956608268432319164276123046875

0.3793755068937550323227014814619906246662139892578125

0.390127737226277293558496239711530506610870361328125

0.397733171127331619487677016877569258213043212890625

0.405336577453365709544641504180617630481719970703125

0.412939983779399799601605991483666002750396728515625

0.458560421735604162307708975276909768581390380859375

0.48137064071370634366076046717353165149688720703125

0.48897404703974043371772495447658002376556396484375

0.496577453365774434956847471767105162143707275390625

0.5003811841038118046753879752941429615020751953125
```

```
0.504184914841848996758244538796134293079376220703125

0.507232360097323553560499931336380541324615478515625

0.508759124087591185769952062400989234447479248046875

0.513649635036496299278496735496446490287780761718755
                              0.517453365774533580179195269010961055755615234375

0.590446066504460631563233619090169668197631835937 5

0.809545823195458247312217281432822346687316894531 25
                              ]
}
DEF THUNDER1
Aircraft {
              geoOrigin USE AirPlan_Origin
              geoSystem ["UTM", "Z11"]
              AircraftName "F15"
              AircraftType [ F15 {Top_Description "**THUNDER1**"} ]
              CallSign "THUNDER1"
              MissionNumber "AIRSTRIP01"
              Mission "INT"
              TakeoffPosition "3794850 578200 0"
              WayPoints["3794850 578200 3000"
                           "3795750 576000
3003.050000000000181898940354585647583007812 5"
                           "3802000 569000
9097.56000000000130967237055301666259765625"
                           "3881000 536000
9097.56000000000130967237055301666259765625"
                           "3942250 528150
9097.56000000000130967237055301666259765625"
                           "3940000 511000
9097.56000000000130967237055301666259765625"
                           "3919000 506000
9097.56000000000130967237055301666259765625"
                           "3881000 536000
9097.56000000000130967237055301666259765625"
                           "3802000 569000
9097.56000000000130967237055301666259765625"
                           "3795750 576000
3003.050000000000181898940354585647583007812 5"
                           "3794850 578200 3000"
                           ]
              WayPointTime[0.517031630170316258698903766344301402568817138671875

0.526068532035685265668689680751413106918334960937 5

0.534328872668288656910817735479213297367095947265625
                              0.599426196269261879479017807170748710632324218 75

0.646378751013787411494604384643025696277618408203125

0.659529602595296005063119082478806376457214355468 75
                              0.675942822384428154691704548895359039306640625
                              0.712755474452554693698402843438088893890380859375

0.777852798053527916266602915129624307155609130859375

0.786113138686131396326572939869947731494903564453125
```

```
0.787921735604217410298133472679182887077331542968 75
                              ]
}
DEF THUNDER2
Aircraft {
             geoOrigin USE AirPlan_Origin
             geoSystem ["UTM", "Z11"]
             AircraftName "F15"
             AircraftType [ F15 {Top_Description "**THUNDER2**"} ]
             CallSign "THUNDER2"
             MissionNumber "AIRSTRIP02"
             Mission "INT"
             TakeoffPosition "3794850 578200 0"
             WayPoints["3794850 578200 3000"
                          "3795750 576000
3003.05000000000018189894035458564758300781 25"
                          "3802000 569000
9097.56000000000130967237055301666259765625"
                          "3881000 536000
9097.56000000000130967237055301666259765625"
                          "3942250 529000
9097.56000000000130967237055301666259765625"
                          "3940000 511000
9097.56000000000130967237055301666259765625"
                          "3919000 506000
9097.56000000000130967237055301666259765625"
                          "3881000 536000
9097.56000000000130967237055301666259765625"
                          "3802000 569000
9097.56000000000130967237055301666259765625"
                          "3795750 576000
3003.05000000000018189894035458564758300781 25"
                          "3794850 578200 3000"
                          ]
             WayPointTime[0.523114355231143512980906962184235453605651855468 75
                              0.532151257096512608768534846603870391845703125

0.540411597729115911192820931319147348403930664062 5

0.605508921330089133761021003010682761669158935546875
                              0.652382400648824045674700755625963211059570312 5

0.666175993511759934051497111795470118522644042968 75

0.682589213300892172497924548224546015262603759765625
                              0.719401865369018622686780872754752635955810546875

0.784499188969991845254980944446288049221038818359375

0.792759529602595236497108999174088239669799804687 5

0.794566098945661014596453242120333015918731689453125
                              ]
}
DEF THUNDER3
Aircraft {
             geoOrigin USE AirPlan_Origin
             geoSystem ["UTM", "Z11"]
             AircraftName "F15"
             AircraftType [ F15 {Top_Description "**THUNDER3**"} ]
             CallSign "THUNDER3"
```

```
            MissionNumber "AIRSTRIP03"
            Mission "INT"
            TakeoffPosition "3794850 578200 0"
            WayPoints["3794850 578200 3000"
                      "3795750 576000
3003.05000000000018189894035458564758300781 25"
                      "3802000 569000
9097.5600000000013096723705530166625976 5625"
                      "3881000 536000
9097.5600000000013096723705530166625976 5625"
                      "3942250 529850
9097.5600000000013096723705530166625976 5625"
                      "3940000 511000
9097.5600000000013096723705530166625976 5625"
                      "3919000 506000
9097.5600000000013096723705530166625976 5625"
                      "3881000 536000
9097.5600000000013096723705530166625976 5625"
                      "3802000 569000
9097.5600000000013096723705530166625976 5625"
                      "3795750 576000
3003.05000000000018189894035458564758300781 25"
                      "3794850 578200 3000"
                      ]
            WayPointTime[0.5200729927007299302488263492705300450325 01220703125

0.529109894566098937218612263677641749382019 04296875

0.5373702351987023284607403184054419398307800 29296875

0.6024675587996755510289403900969773530960083 0078125

0.64927210056772102220179476717021316289901733 3984375

0.663706407137064058332498461822979152202606 201171875

0.6801216545012165326511421881150454282760620 1171875

0.7169322789943226581499402527697384357452392 578125

0.7820296025952959695359822944737970829010009 765625

0.79028994322789936077811034920159727334976196 2890625

0.792098540145985374749670882010832428932189 94140625
                        ]
}
DEF UNCLESAM1
Aircraft {
            geoOrigin USE AirPlan_Origin
            geoSystem ["UTM", "Z11"]
            AircraftName "F15"
            AircraftType [ F15 {Top_Description "**UNCLESAM1**"} ]
            CallSign "UNCLESAM1"
            MissionNumber "SAM1"
            Mission "INT"
            TakeoffPosition "3794850 578200 0"
            WayPoints["3794850 578200 3000"
                      "3795750 576000
3003.05000000000018189894035458564758300781 25"
                      "3802000 569000
12146.340000000001455191522836685180664 0625"
```

```
                         "3881000 536000
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                         "3794850 578200 3000"
                         ]
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0.543627331711273331649181272950954735279083251953125

0.58745944849959439437725450261496007442474365234375

0.593296836982968311957620244356803596019744873046875

0.60971208434712078627626397064886987209320068359375

0.646522708840227000592904005316086113452911376953125

0.711620032441200311978946047020144760608673095703125

0.72126115166261151046001032227650284767150878906250

0.72306772100567719974151259521022439002990722656250
                           ]
}
DEF UNCLESAM2
Aircraft {
        geoOrigin USE AirPlan_Origin
        geoSystem ["UTM", "Z11"]
        AircraftName "F15"
        AircraftType [ F15 {Top_Description "**UNCLESAM2**"} ]
        CallSign "UNCLESAM2"
        MissionNumber "SAM2"
        Mission "INT"
        TakeoffPosition "3794850 578200 0"
        WayPoints["3794850 578200 3000"
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                         "3919000 506000
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3003.0500000000001818989403545856475830078125"
                          "3794850 578200 3000"
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                             0.48258515815085161193564999848604202270507812 5

0.54768248175182474568600810016505420207977294921875

0.5887793998377938819999144470784813165664672851 5625

0.59671938361719378818293080257717519998550415039062 5

0.61313260340632602662935823900625109672546386718 75

0.649945255474452476818214563536457717418670654296875

0.71504055150040546351419834536500275135040283203125 `

0.724681670721816661995262620621360838413238525390625

0.72648824006488235127676489355508238077163696289 0625
                             ]
}
DEF UNCLESAM3
Aircraft {
            geoOrigin USE AirPlan_Origin
            geoSystem ["UTM", "Z11"]
            AircraftName "F15"
            AircraftType [ F15 {Top_Description "**UNCLESAM3**"} ]
            CallSign "UNCLESAM3"
            MissionNumber "SAM3"
            Mission "INT"
            TakeoffPosition "3794850 578200 0"
            WayPoints["3794850 578200 3000"
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                          "3795750 576000
3003.0500000000001818989403545856475830078125"
                          "3794850 578200 3000"
                          ]
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0.476999188969991827491412550443783402442932128906 25

0.48664030819140311479031879571266472339630126953125
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0.59086374695863730366340860200580209493637084960937 5

0.60229318734793180212250263139139860868453979492187 5

0.61870843471208427644114635768346488475799560546875

0.65551905920519049075778639235068112611770629882812 5

0.72061638280616371332598646404221653938293457031 25

0.73025750202757500062489270931109786033630371093 75

0.73206407137064051227071104221977293491363525390625
                                   ]
}
DEF UNCLESAM4
Aircraft {
          geoOrigin USE AirPlan_Origin
          geoSystem ["UTM", "Z11"]
          AircraftName "F15"
          AircraftType [ F15 {Top_Description "**UNCLESAM4**"} ]
          CallSign "UNCLESAM4"
          MissionNumber "SAM4"
          Mission "INT"
          TakeoffPosition "3794850 578200 0"
          WayPoints["3794850 578200 3000"
                    "3795750 576000
3003.05000000000018189894035458564758300781 25"
                    "3802000 569000
12146.340000000000145519152283668518066406 25"
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                    "3925350 528600
12146.340000000000145519152283668518066406 25"
                    "3940000 511000
12146.340000000000145519152283668518066406 25"
                    "3919000 506000
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                    "3881000 536000
12146.340000000000145519152283668518066406 25"
                    "3802000 569000
12146.340000000000145519152283668518066406 25"
                    "3795750 576000
3003.05000000000018189894035458564758300781 25"
                    "3794850 578200 3000"
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                                   0.46636455798864560051697480957955121994018554687 5

0.53146188158961882308517488127108663320541381835937 5

0.56564882400648821558775125595275312662124633789062 5

0.58306163828061645659772693761624395847320556640625
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0.599474858069748517408470434020273387432098388671875

0.63628548256285473172511046868748962879180908203125

0.701382806163827954293310540379025042057037353515625

0.71102392538523933041005875566042959690093994140625
                              0.712830494728304842055877088569104671478271484375
                              ]
}
DEF UNCLESAM5
Aircraft {
              geoOrigin USE AirPlan_Origin
              geoSystem ["UTM", "Z11"]
              AircraftName "F15"
              AircraftType [ F15 {Top_Description "**UNCLESAM5**"} ]
              CallSign "UNCLESAM5"
              MissionNumber "SAM5"
              Mission "INT"
              TakeoffPosition "3794850 578200 0"
              WayPoints["3794850 578200 3000"
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3003.0500000000001818989403545856475830078125"
                           "3802000 569000
12146.34000000000014551915228366851806640625"
                           "3881000 536000
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                           "3921400 537500
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                           "3934000 550000
12146.34000000000014551915228366851806640625"
                           "3916000 562000
12146.34000000000014551915228366851806640625"
                           "3881000 536000
12146.34000000000014551915228366851806640625"
                           "3802000 569000
12146.34000000000014551915228366851806640625"
                           "3795750 576000
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                           "3794850 578200 3000"
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0.5581467964314679619519665720872581005096435546875
                              0.571640308191403079263182007707655429840087890625

0.58809002433090018513439645175822079181671142578125

0.621240875912408707648637573583982884883880615234375

0.68633819951338193021683764527551829814910888671875

0.6959772911597728040078436606563627719879150390625

0.697785888077858817979404193465597927570343017578125
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                                ]
}
DEF UNCLESAM6
Aircraft {
            geoOrigin USE AirPlan_Origin
            geoSystem ["UTM", "Z11"]
            AircraftName "F15"
            AircraftType [ F15 {Top_Description "**UNCLESAM6**"} ]
            CallSign "UNCLESAM6"
            MissionNumber "SAM6"
            Mission "INT"
            TakeoffPosition "3794850 578200 0"
            WayPoints["3794850 578200 3000"
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3003.0500000000001818989403545856475830078125"
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                        "3924700 542150
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                        "3881000 536000
12146.34000000000014551915228366851806640625"
                        "3802000 569000
12146.34000000000014551915228366851806640625"
                        "3795750 576000
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0.56907137064071360299521984416060149669647216796875

0.57832522303325228918424727453384548425674438476562 5

0.59477291159772907036540345870889723300933837890625

0.62792579075425782875186087039764970541000366210937 5

0.69302108678021081544784465222619473934173583984375

0.70266220600162201392890892748255282640457153320312 5

0.70446877534468761439256923040375113487243652343750
                                ]
}
DEF UNCLESAM7
Aircraft {
            geoOrigin USE AirPlan_Origin
            geoSystem ["UTM", "Z11"]
            AircraftName "F15"
            AircraftType [ F15 {Top_Description "**UNCLESAM7**"} ]
            CallSign "UNCLESAM7"
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              MissionNumber "SAM7"
              Mission "INT"
              TakeoffPosition "3794850 578200 0"
              WayPoints["3794850 578200 3000"
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                          "3802000 569000
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                          "3919600 546800
12146.34000000000014551915228366851806640625"
                          "3934000 550000
12146.34000000000014551915228366851806640625"
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12146.34000000000014551915228366851806640625"
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3003.0500000000001818989403545856475830078125"
                          "3794850 578200 3000"
                          ]
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0.474474858069748606226312404032796621322631835937 5

0.5395721816707218287945124757243320345878601074218 75

0.57004866180048647805733708082698285579681396484375

0.58126520681265203549514808400999754667282104492187 5

0.59771289537712899431198820821009576320648193359375

0.63086374695863742800838736002333462238311767578125

0.695961070559610650576587431714870035648345947265625
                             0.705602189781021849057651706971228122711181640625

0.707408759124087627156995949917472898960113525390625
                             ]
}
DEF UNCLESAM8
Aircraft {
              geoOrigin USE AirPlan_Origin
              geoSystem ["UTM", "Z11"]
              AircraftName "F15"
              AircraftType [ F15 {Top_Description "**UNCLESAM8**"} ]
              CallSign "UNCLESAM8"
              MissionNumber "SAM8"
              Mission "INT"
              TakeoffPosition "3794850 578200 0"
              WayPoints["3794850 578200 3000"
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3003.0500000000001818989403545856475830078125"
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12146.34000000000014551915228366851806640625"
                              "3916000 562000
12146.34000000000014551915228366851806640625"
                              "3881000 536000
12146.34000000000014551915228366851806640625"
                              "3802000 569000
12146.34000000000014551915228366851806640625"
                              "3795750 576000
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0.49069545823195461764498759293928742408752441406 25

0.55579278183292775139534569461829960346222192382812 5

0.58756285482562855548849256592802703380584716796875

0.60052311435523115790147130610421299934387207031 25

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0.71521897810218977298291065380908548831939697265625
                                0.72486009732360088264613295905292034149169921875

0.72666666666666666607454772019991651177406311035156 25
                                ]
}
DEF UNCLESAM9
Aircraft {
          geoOrigin USE AirPlan_Origin
          geoSystem ["UTM", "Z11"]
          AircraftName "F15"
          AircraftType [ F15 {Top_Description "**UNCLESAM9**"} ]
          CallSign "UNCLESAM9"
          MissionNumber "SAM9"
          Mission "INT"
          TakeoffPosition "3794850 578200 0"
          WayPoints["3794850 578200 3000"
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3003.05000000000018189894035458564758300781 25"
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12146.34000000000014551915228366851806640625"
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12146.34000000000014551915228366851806640625"
                              "3934000 550000
12146.34000000000014551915228366851806640625"
                              "3916000 562000
12146.34000000000014551915228366851806640625"
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0.570391321978913179435721758636645972728729248046875

0.609416058394160575772957599838264286518096923828125

0.616559205190592063416943346965126693248748779296875

0.633006893755068933415941501152701675891876220703125

0.66615977291159769180239891284145414829254150390625

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0.74089618815896169934376302990131080150604248046875
                                0.7427027575020275662609492428600788116455078125
                                ]
}
DEF UNCLESAM10
Aircraft {
          geoOrigin USE AirPlan_Origin
          geoSystem ["UTM", "Z11"]
          AircraftName "F15"
          AircraftType [ F15 {Top_Description "**UNCLESAM10**"} ]
          CallSign "UNCLESAM10"
          MissionNumber "SAM10"
          Mission "INT"
          TakeoffPosition "3794850 578200 0"
          WayPoints["3794850 578200 3000"
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                              "3934000 550000
12146.34000000000014551915228366851806640625"
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0.62200932684509329106958830379880964756011962890625

0.6319991889699917209100021864287555217742919921875

0.64844890510948891559905860049184411764144897460937 5

0.68159975669099761574898366234265267848968505859375

0.7466970802919707494993417640216648578643798828125

0.75633617193836162329034777940250933170318603515625

0.75814476885644763726190831221174448728561401367187 5
                              ]
}
DEF UNCLESAM11
Aircraft {
         geoOrigin USE AirPlan_Origin
         geoSystem ["UTM", "Z11"]
         AircraftName "F15"
         AircraftType [ F15 {Top_Description "**UNCLESAM11**"} ]
         CallSign "UNCLESAM11"
         MissionNumber "SAM11"
         Mission "INT"
         TakeoffPosition "3794850 578200 0"
         WayPoints["3794850 578200 3000"
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3003.05000000000018189894035458564758300781 25"
                  "3802000 569000
12146.340000000000145519152283668518066406 25"
                  "3881000 536000
12146.340000000000145519152283668518066406 25"
                  "3937000 529000
12146.340000000000145519152283668518066406 25"
                  "3940000 511000
12146.340000000000145519152283668518066406 25"
                  "3919000 506000
12146.340000000000145519152283668518066406 25"
                  "3881000 536000
12146.340000000000145519152283668518066406 25"
                  "3802000 569000
12146.340000000000145519152283668518066406 25"
                  "3795750 576000
3003.05000000000018189894035458564758300781 25"
                  "3794850 578200 3000"
                  ]
         WayPointTime[0.4906731549067314901435565843712538480758666992187 5

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0.50934914841849154854003245418425649404525756835937 5

0.5744464720194647711082325258757919073104858398437 5

0.61735806974858062901034827518742531538009643554687 5
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0.684456609894566003760019157198257744312286376953125

0.749553933495539226328219228889793157577514648437500

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                                ]
}
DEF UNCLESAM12
Aircraft {
              geoOrigin USE AirPlan_Origin
              geoSystem ["UTM", "Z11"]
              AircraftName "F15"
              AircraftType [ F15 {Top_Description "**UNCLESAM12**"} ]
              CallSign "UNCLESAM12"
              MissionNumber "SAM12"
              Mission "INT"
              TakeoffPosition "3794850 578200 0"
              WayPoints["3794850 578200 3000"
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                          "3794850 578200 3000"
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0.582556772100567776817570120329037308692932128906250

0.629168694241687020962672249879688024520874023437500

0.637278994322789760218483934295363724231719970703125

0.653692214111922265118437280762009322643280029296875
                              0.690504866180048537671609665267169475555419921875
                              0.755600162206001613185435417108237743377685546875

0.765241281427412634030815752339549362659454345703125
```

```
0.76704785077047841213015999528579413890838623046875
                                 ]
}
DEF UNCLESAM13
Aircraft {
             geoOrigin USE AirPlan_Origin
             geoSystem ["UTM", "Z11"]
             AircraftName "F15"
             AircraftType [ F15 {Top_Description "**UNCLESAM13**"} ]
             CallSign "UNCLESAM13"
             MissionNumber "SAM13"
             Mission "INT"
             TakeoffPosition "3794850 578200 0"
             WayPoints["3794850 578200 3000"
                         "3795750 576000
3003.05000000000181898940354585647583007812 5"
                         "3802000 569000
12146.340000000000145519152283668518066406 25"
                         "3881000 536000
12146.340000000000145519152283668518066406 25"
                         "3945500 526650
12146.340000000000145519152283668518066406 25"
                         "3940000 511000
12146.340000000000145519152283668518066406 25"
                         "3919000 506000
12146.340000000000145519152283668518066406 25"
                         "3881000 536000
12146.340000000000145519152283668518066406 25"
                         "3802000 569000
12146.340000000000145519152283668518066406 25"
                         "3795750 576000
3003.05000000000181898940354585647583007812 5"
                         "3794850 578200 3000"
                         ]
             WayPointTime[0.502838605028385998707562976051121950149536132 8125

0.51187347931873468098729063058272004127502441 40625

0.52151459854014596828619687585160136222839355 46875

0.58661192214111927967223891755566000938415527 34375

0.63616585563665859481830011645797640085220336 9140625

0.64877939983779402410846159909851849079132080 078125

0.66519261962692617373704706551507115364074707 03125

0.70200527169505253510806142003275454044342041 015625

0.76710259529602602412978740176185965538024902 34375

0.77674168694241689792079341714270412921905517 578125

0.77855028386050273425667000992689281702041625 9765625
                                 ]
}

Target {
geoOrigin USE AirPlan_Origin
geoSystem ["UTM", "Z11"]
```

```
TargetType [Early_Warning_Radar{} ]
TargetPosition "3923200 536600 0"
}

Target {
geoOrigin USE AirPlan_Origin
geoSystem ["UTM", "Z11"]
TargetType [Early_Warning_Radar{} ]
TargetPosition "3928800 511300 0"
}

Target {
geoOrigin USE AirPlan_Origin
geoSystem ["UTM", "Z11"]
TargetType [SAM_Site{} ]
TargetPosition "3932400 509900 0"
}

Target {
geoOrigin USE AirPlan_Origin
geoSystem ["UTM", "Z11"]
TargetType [SAM_Site{} ]
TargetPosition "3931750 517400 0"
}

Target {
geoOrigin USE AirPlan_Origin
geoSystem ["UTM", "Z11"]
TargetType [SAM_Site{} ]
TargetPosition "3930750 522850 0"
}

Target {
geoOrigin USE AirPlan_Origin
geoSystem ["UTM", "Z11"]
TargetType [SAM_Site{} ]
TargetPosition "3925350 528600 0"
}

Target {
geoOrigin USE AirPlan_Origin
geoSystem ["UTM", "Z11"]
TargetType [SAM_Site{} ]
TargetPosition "3921400 537500 0"
}

Target {
geoOrigin USE AirPlan_Origin
geoSystem ["UTM", "Z11"]
TargetType [SAM_Site{} ]
TargetPosition "3924700 542150 0"
}

Target {
geoOrigin USE AirPlan_Origin
geoSystem ["UTM", "Z11"]
TargetType [SAM_Site{} ]
TargetPosition "3919600 546800 0"
}

Target {
geoOrigin USE AirPlan_Origin
```

```
geoSystem ["UTM", "Z11"]
TargetType [SAM_Site{} ]
TargetPosition "3917900 555600 0"
}

Target {
geoOrigin USE AirPlan_Origin
geoSystem ["UTM", "Z11"]
TargetType [SAM_Site{} ]
TargetPosition "3932100 540800 0"
}

Target {
geoOrigin USE AirPlan_Origin
geoSystem ["UTM", "Z11"]
TargetType [SAM_Site{} ]
TargetPosition "3938200 537550 0"
}

Target {
geoOrigin USE AirPlan_Origin
geoSystem ["UTM", "Z11"]
TargetType [SAM_Site{} ]
TargetPosition "3937000 529000 0"
}

Target {
geoOrigin USE AirPlan_Origin
geoSystem ["UTM", "Z11"]
TargetType [SAM_Site{} ]
TargetPosition "3940600 521650 0"
}

Target {
geoOrigin USE AirPlan_Origin
geoSystem ["UTM", "Z11"]
TargetType [SAM_Site{} ]
TargetPosition "3945500 526650 0"
}

             ]#--children Main
        }#--Group Main
ROUTE Master_Control.fraction_changed TO EARLYBIRD1.set_fraction
ROUTE Master_Control.fraction_changed TO EARLYBIRD2.set_fraction
ROUTE Master_Control.fraction_changed TO THUNDER1.set_fraction
ROUTE Master_Control.fraction_changed TO THUNDER2.set_fraction
ROUTE Master_Control.fraction_changed TO THUNDER3.set_fraction
ROUTE Master_Control.fraction_changed TO UNCLESAM1.set_fraction
ROUTE Master_Control.fraction_changed TO UNCLESAM2.set_fraction
ROUTE Master_Control.fraction_changed TO UNCLESAM3.set_fraction
ROUTE Master_Control.fraction_changed TO UNCLESAM4.set_fraction
ROUTE Master_Control.fraction_changed TO UNCLESAM5.set_fraction
ROUTE Master_Control.fraction_changed TO UNCLESAM6.set_fraction
ROUTE Master_Control.fraction_changed TO UNCLESAM7.set_fraction
ROUTE Master_Control.fraction_changed TO UNCLESAM8.set_fraction
ROUTE Master_Control.fraction_changed TO UNCLESAM9.set_fraction
ROUTE Master_Control.fraction_changed TO UNCLESAM10.set_fraction
ROUTE Master_Control.fraction_changed TO UNCLESAM11.set_fraction
ROUTE Master_Control.fraction_changed TO UNCLESAM12.set_fraction
ROUTE Master_Control.fraction_changed TO UNCLESAM13.set_fraction
```

APPENDIX Z. MASTER CONTROL PROTO

```
#VRML V2.0 utf8

# The Master Control PROTO uses PROTOs found in the PROTO Repository
# The HeadsUpGeom is used to make a display "stick" to the screen
# The slide and button PROTOs are used to control the time compression
# The Master Control PROTO also is the Master Time server of the Virtual World
# The PROTO is simple in nature but requires a significant amount of PROTO
# Repository Code to implement the diplay

#Author: Jason Quigley
#Modified: 10 June 2000

PROTO HeadsUpGeom [
                    eventOut      SFVec3f     position_changed
                    eventOut      SFRotation  orientation_changed
                    exposedField  SFVec3f     center               0 0 0
                    exposedField  SFVec3f     size                 1000000000
1000000000 1000000000
                    exposedField  SFBool      enabled              TRUE
                    exposedField  MFNode      children             []
               ]

{#--BEGIN HeadsUPGeom

      Collision {
            collide FALSE
            children [
                  DEF PS1 ProximitySensor {
                        center               IS center
                        size                 IS size
                        enabled              IS enabled
                        orientation_changed  IS orientation_changed
                        position_changed     IS position_changed
                  }

                  DEF XFORM Transform {
                        children IS children
                  }
            ]
      }

      ROUTE PS1.position_changed TO PS1.set_center
      ROUTE PS1.position_changed TO XFORM.set_translation
      ROUTE PS1.orientation_changed TO XFORM.set_rotation

}#--END HeadsUpGeom


PROTO Button [
   field         SFBool     noloop         FALSE
   eventIn       SFBool     set_state
   field         SFBool     state          FALSE
   eventOut      SFBool     state_changed
   exposedField  SFColor    onColor        0.0 1.0 0.0
   exposedField  SFColor    offColor       1.0 0.0 0.0
   exposedField  SFNode     button         Cylinder { height .0145 radius .015 }
   exposedField  MFNode     base           Transform {
```

```
                                rotation 1 0 0 1.5707963
                        children Shape {
                                appearance Appearance {
                                        material Material { diffuseColor 0.0
0.0 1.0 }
                                        }
                                geometry Cylinder { height .015 radius .02 }
                                }
                        }
]
 {
Group { children [
        Transform {
                translation 0 0 -.005
                children IS base
        }
        DEF INOUT Transform {
                rotation 1 0 0 1.5707963
                translation 0 0 .005
        children [
                DEF TOUCH TouchSensor {}
                DEF COLOR Switch {
                        whichChoice 0
                choice [
                        Shape {
                        appearance Appearance {
                        material Material { diffuseColor IS offColor }
                                }
                                geometry IS button
                        }
                        Shape {
                        appearance Appearance {
                                material Material {
                                        diffuseColor IS onColor }
                                }
                                geometry IS button
                        }
                ]
                }
        ]
        }
        DEF CONTROL Script {
                field SFBool noloop IS noloop
                eventIn SFBool isOver
                eventIn SFBool isActive
                eventIn SFBool set_state IS set_state
                field SFBool onGeom FALSE
                field SFBool bDown FALSE
                field SFBool state IS state
                eventOut SFBool state_changed IS state_changed
                field SFVec3f push_pos 0 0 -.004
                field SFVec3f in_pos 0 0 0
                field SFVec3f out_pos 0 0 .005
                eventOut SFVec3f pos_changed
                eventOut SFInt32 choice_changed
                url [ "javascript:
function initialize()
{
if (state) {
        pos_changed = in_pos;
        choice_changed = 1;
} else {
```

```
        pos_changed = out_pos;
        choice_changed = 0;
        }
if (!(noloop)) state_changed = state;
}

function set_state(value)
{
state = value;
if (!(noloop)) state_changed = value;
if (value) {
        pos_changed = in_pos;
        choice_changed = 1;
} else {
        pos_changed = out_pos;
        choice_changed = 0;
        }
}

function isOver(value)
{
onGeom = value;
if (value && bDown)
        pos_changed = push_pos;
else if (state)
        pos_changed = in_pos;
else
        pos_changed = out_pos;
}

function isActive(value)
{
bDown = value;
if (value) pos_changed = push_pos;
else {
        if (onGeom) {
                state_changed = (!(state));
                state = (!(state));
                }
        if (state) {
                pos_changed = in_pos;
                choice_changed = 1;
        } else {
                pos_changed = out_pos;
                choice_changed = 0;
                }
        }
}
"]
        }
] }
ROUTE TOUCH.isOver TO CONTROL.isOver
ROUTE TOUCH.isActive TO CONTROL.isActive
ROUTE CONTROL.choice_changed TO COLOR.set_whichChoice
ROUTE CONTROL.pos_changed TO INOUT.set_translation
}



PROTO Slider [
```

```
   eventIn      SFFloat    set_fraction
   field        SFFloat    fraction          .5
   field        SFBool     noloop            FALSE
   eventOut     SFFloat    fraction_changed
   eventOut     SFTime     touchTime
   exposedField SFBool     enabled           TRUE
   exposedField MFNode     thumb             Transform {
                                scale .08 .04 .08
                        children Shape {
                                appearance Appearance {
                                        material Material {
                                                diffuseColor 0 0 1
                                        }
                                }
                                geometry Sphere {}
                                }
                        }
   exposedField MFNode     slide             Shape {
                        appearance Appearance {
                                material Material {
                                        diffuseColor .75 .75 .75
                                        shininess .9
                                        }
                                }
                        geometry Cylinder {
                                radius .01
                                height 1.1
                                }
                        }
]
 {
Group { children [
        DEF OUTPUT Script {
                field SFNode init DEF INIT TimeSensor { loop TRUE }
                eventIn SFTime initme
                eventOut SFTime stopit
                eventIn SFFloat set_fraction IS set_fraction
                field SFFloat fraction IS fraction
                field SFBool noloop IS noloop
                eventOut SFVec3f offset_changed
                eventIn SFVec3f set_translation
                eventOut SFFloat fraction_changed IS fraction_changed
                eventIn SFBool is_Active
                eventOut SFTime touchTime IS touchTime
                url [ "javascript:
function initialize()
{
fraction_changed = fraction;
offset_changed[0] = fraction;
offset_changed[1] = 0;
offset_changed[2] = 0;
}

function set_fraction(value)
{
if (!(noloop)) fraction_changed = value;
fraction = value;
offset_changed[0] = value;
offset_changed[1] = 0;
offset_changed[2] = 0;
}
```

```
function set_translation(value)
{
fraction_changed = value[0];
fraction = value[0];
}

function is_Active(value, thetime)
{ if (value) touchTime = thetime; }
"]
        }
        Transform {
                translation -.5 0 0
        children [
                DEF RAIL PlaneSensor {
                        enabled IS enabled
                        maxPosition 1 0
                        minPosition 0 0
                        offset .5 0 0
                        autoOffset TRUE
                }
                Transform {
                        rotation 0 0 1 1.5707963
                        translation .5 0 0
                        children IS slide
                }
                DEF BEAD Transform {
                        rotation 0 0 1 1.5707963
                        translation .5 0 0
                        children IS thumb
                }
        ] }
] }
ROUTE INIT.time TO OUTPUT.initme
ROUTE OUTPUT.stopit TO INIT.set_stopTime
ROUTE RAIL.translation_changed TO BEAD.set_translation
ROUTE OUTPUT.offset_changed TO BEAD.set_translation
ROUTE OUTPUT.offset_changed TO RAIL.set_offset
ROUTE RAIL.translation_changed TO OUTPUT.set_translation
ROUTE RAIL.isActive TO OUTPUT.is_Active
}

#*****************************************************
#The Master control proto is responsible for sendingout time events from the
masterclock
#and controls the speed of the clock with a slider.
#
#****************************************************


PROTO Master_Control [exposedField SFTime cycleInterval 60
                    field     SFFloat time_hold 60 # used to solve problem with
exposedfield & js
                    eventOut        SFFloat fraction_changed
                    field      SFFloat run_time 60
                      ]


{#--Begin Master Control


Group {
     children [
```

```
                    Group {
                           children [

                           HeadsUpGeom {
                                children [
                                  Transform {
#                                        translation 0 0 0
                                         scale 800 800 800
                                         translation 650 100 -500
                                                children[

#************************************
# Display the Time compression slide
#************************************

#*******************************************************************
#The next section should be shifted to Right to Fit under HeadsupGeo
#children.  The section is placed to the left for readability
#********************************************************************
       Transform {
           translation 2 -1.5 -5
           scale 1 1 1
          children [
              Transform {
                     translation 0 0 0
                     children[
                            Shape {
                                   appearance Appearance {
                                     material Material { diffuseColor  0 1 1}
                                   }
                                   geometry Text {
                                    string [ "Fast                      Slow" ]
                                     fontStyle FontStyle {
                                     family  "SANS"
                                            style   "BOLD"
                                            justify "MIDDLE"
                                            size    .25
                                     spacing 1.5
                                     }
                                                }
                                 }#--shape
                            ]
                     }

DEF Time_Slide                Slider {},

              Transform {
                     translation 0 -.3 0
                     scale 5 5 5
                     children DEF BUTTON Button {
                                         button Cylinder { height .0145 radius
.015 }
                                         }
                      }


Transform {
             translation -1 -.65 0
             children Shape {
                 appearance Appearance {
                     material Material {
```

```
                    diffuseColor  0.0 1.0 1.0

                }
            }
            geometry DEF Slide_Message Text {
                fontStyle FontStyle {
                    size .25
                    justify "FIRST"
                }
            }
        }
    },
Transform {
        translation -1 1 0
        children Shape {
            appearance Appearance {
                material Material {
                    diffuseColor  0.0 1.0 0.0
                    emissiveColor 1.0 1.0 1.0
                }
            }
            geometry DEF Temp_Message Text {
                fontStyle FontStyle {
                    size .25
                    justify "FIRST"
                }
            }
        }
    },
Transform {
        translation -1 -.85 0
        children Shape {
            appearance Appearance {
                material Material {
                    diffuseColor  0.0 1.0 1.0

                }
            }
            geometry DEF Time_Message Text {
                fontStyle FontStyle {
                    size .25
                    justify "FIRST"
                }
            }
        }
    }


      ]#-children controls
    }#--transform controls
#************************************
#End of Shifted Section
#************************************

                                                  ]#--T children
                                                }#--Transform
                                              ]#--Heads-children
                                            }#--HeadsupGeom
                                ]
                              }#--end group
```

```
DEF Master_Clock TimeSensor {
                                cycleInterval IS cycleInterval
                                loop TRUE
                                fraction_changed IS fraction_changed
                 }



    DEF Time_Control Script {
             field    SFFloat time_hold IS time_hold
             field    SFTime Time_Temp 150
             eventIn  SFFloat  set_time
             eventOut SFTime   cycle_changed

          url "javascript:

               function set_time( f, ts ) {
                   Time_Temp = f * time_hold;
                   cycle_changed=Time_Temp
             };"
                   },


       ]#--END Mainchildren
       }#--END Main Group

#  The next script displays strings to indicate total elapesed time in the ato
and scale time
# or total play time  The time calculations look awkward because I coundn't
find a time function to truncate or quotient
# and my format script makes use of rounding.  The calculation provides integer
#results to remove rounding errors
        DEF Control_labeler Script {
            url "javascript:
               function initalize( ) {
                   S_string_changed[0] = label_S + ':';
                   T_string_changed[0] = label_T + ':'
               }


             function formatDecimal(argvalue, addzero, decimaln) {

                   var numOfDecimal = (decimaln == null) ? 2 : decimaln;
                   var number = 1;
                   number = Math.pow(10, numOfDecimal);
                   argvalue = Math.round(parseFloat(argvalue) * number) /
number;
                   argvalue = '' + argvalue;

                   if (argvalue.indexOf('.') == 0)
                   argvalue = '0' + argvalue;

                   if (addzero == true) {
                          if (argvalue.indexOf('.') == -1)
                                 argvalue = argvalue + '.';
```

```
                            while ((argvalue.indexOf('.') + 1) > (argvalue.length
- numOfDecimal))
                                        argvalue = argvalue + '0';
                        }

                        return argvalue;
                }


                function set_time( t, ts ) {

                  total_time=(t*scale);
                  var hour = (total_time-(total_time % 3600 ))/3600;
               var min  = ((total_time % 3600)-((total_time % 3600) % 60))/60;
                  var secs = (total_time % 3600) % 60;
    Temp_string[0]=(total_time + ' secs');
    T_string_changed[0] =
label_T + ': ' + formatDecimal(hour,false,0)+' hr '+
formatDecimal(min,false,0)+ ' min '+ formatDecimal(secs,false,0)+' secs';

                 if (total_time > stop){

                 total_time=0;
                 bool_changed=FALSE}

                 }


                  function set_scale( s, ts ) {
                    S_string_changed[0] = label_S + ': ' +
formatDecimal(s,true,1) +  ' secs';
                  }

                    "
            field    SFFloat     scale IS run_time
            field    SFFloat     hour 1
            field    SFFloat     stop IS run_time
            field    SFFloat     total_time 0
            field    SFString    label_T "Elapased Time"
            field    SFString    label_S "Play Speed"
            eventIn  SFFloat     set_time
            eventIn  SFTime      set_scale
            eventOut SFBool      bool_changed
            eventOut MFString    S_string_changed
            eventOut MFString    T_string_changed
            eventOut MFString    Temp_string
            eventOut SFFloat     total_changed
        },


# good stuff

ROUTE Time_Slide.fraction_changed TO Time_Control.set_time
ROUTE Time_Control.cycle_changed TO Master_Clock.set_cycleInterval
ROUTE BUTTON.state_changed TO Master_Clock.enabled

ROUTE Master_Clock.cycleInterval  TO Control_labeler.set_scale
ROUTE Control_labeler.S_string_changed    TO Slide_Message.set_string

ROUTE Master_Clock.fraction_changed  TO Control_labeler.set_time
ROUTE Control_labeler.T_string_changed    TO Time_Message.set_string
```

```
#ROUTE Control_labeler.Temp_string    TO Temp_Message.set_string
ROUTE Control_labeler.bool_changed TO BUTTON.set_state

}#--End Master Control
```

APPENDIX AA. FORT IRWIN TERRAIN

```
#VRML V2.0 utf8
#This is the Ft_Irwin_Terrain PROTO. This proto is used to display a
#3D rendering of an Air Attack Plan.  The attack plan is developed
#using XML.  The XML is tranlated to VRML/X3D and rendered.

#Author: Jason Quigley
#Date: 25 March 2000
#Revised: 10 June 2000

#Future Updates:


WorldInfo {
info [ "This is a PROTO for a 3-D Air Attack Plan Autogenerated by XSL",
       " from and XML Air Attack Plan"
       "This world was Developed by Mark Murray and Jason Quigley",]

title "Terrain PROTO"
}

#The next set of EXTERNPROTO declarations provides access to GeoVRML
#GeoVRML is used to locate and animate the models through geographic
#references.
#
# NOTE: make sure the path name to protos is correct
# original proto was sent with GeoVRML PROTO in a sub folder

EXTERNPROTO Elevation [] ["Terrain\FortIrwindata.wrl#Terrain"
"FortIrwindata.wrl#Terrain"]

EXTERNPROTO geoOrigin [
                    exposedField MFString     geoSystem
                    exposedField SFString     geoCoords
                    field        SFBool    rotateYUp    ]
                    [ "GeoVRML\geoOrigin.wrl"
                      "\..\GeoVRML\geoOrigin.wrl"]


EXTERNPROTO GeoLocation [
                    field SFNode   geoOrigin
                    field MFString geoSystem
                    field SFString geoCoords
                    field MFNode   children
                    eventIn  SFString set_geoCoords
                    eventOut SFString geoCoords_changed ]
                    ["GeoVRML\GeoLocation.wrl"
                     "\..\GeoVRML\GeoLocation.wrl"]

EXTERNPROTO GeoPositionInterpolator [
                    field        SFNode   geoOrigin
                    field        MFString geoSystem
                    field        MFFloat  key
                    field        MFString keyValue
                    eventIn      SFFloat  set_fraction
                    eventOut     SFVec3f  value_changed
                    eventOut     SFString geovalue_changed ]
                    ["GeoVRML\GeoPositionInterpolator.wrl"
                     "\..\GeoVRML\GeoPositionInterpolator.wrl"]
```

```
EXTERNPROTO GeoViewpoint [
                    field        SFNode     geoOrigin
                    field        MFString   geoSystem
                    field        SFString   position
                    field        SFRotation orientation
                    field        SFString   description
                    exposedField SFFloat    fieldOfView
                    exposedField SFBool     jump
                    exposedField MFString   navType
                    eventIn      SFBool     set_bind
                    eventIn      SFString   set_position
                    eventOut     SFTime     bindTime
                    eventOut     SFBool     isBound        ]
                    ["GeoVRML\GeoViewpoint.wrl"
                     "\..\GeoVRML\GeoViewpoint.wrl"]

EXTERNPROTO GeoTouchSensor [
                    exposedField SFBool   enabled              # TRUE
                    field        SFNode   geoOrigin            # NULL
                    field        MFString geoSystem            # [ "GDC" ]
                    eventOut     SFVec3f  hitNormal_changed
                    eventOut     SFVec3f  hitPoint_changed
                    eventOut     SFVec2f  hitTexCoord_changed
                    eventOut     SFBool   isActive
                    eventOut     SFBool   isOver
                    eventOut     SFTime   touchTime
                    eventOut     SFString hitGeoCoord_changed]
                    ["GeoVRML\GeoTouchSensor.wrl"
                     "\..\GeoVRML\GeoTouchSensor.wrl" ]

EXTERNPROTO GeoElevationGrid [
                    field        SFNode   geoOrigin
                    field        MFString geoSystem
                    field        SFString geoGridOrigin
                    field        SFInt32  xDimension
                    field        SFString xSpacing
                    field        SFInt32  zDimension
                    field        SFString zSpacing
                    field        MFFloat  height
                    exposedField SFNode   color
                    exposedField SFNode   texCoord
                    exposedField SFNode   normal
                    field        SFBool   normalPerVertex
                    field        SFBool   ccw
                    field        SFBool   colorPerVertex
                    field        SFFloat  creaseAngle
                    field        SFBool   solid          ]
                    ["GeoVRML\GeoElevationGrid.wrl"
                     "\..\GeoVRML\GeoElevationGrid.wrl"]


PROTO Terrain [
              field        SFNode   geoOrigin NULL
             ]


{# Terrain

Group {
```

```
children [

Background {

    skyColor [
        0.0 0.2 0.7,
        0.0 0.5 1.0,
        1.0 1.0 1.0
    ]
},

GeoViewpoint {
            geoOrigin IS geoOrigin
            geoSystem ["UTM" ,"Z11"]
            position "3935000 595200 200000"
            orientation 1 0 0 -1.57
            description "Theater View"
            navType   ["EXAMINE", "FLY"]
            },
GeoViewpoint {
            geoOrigin IS geoOrigin
            geoSystem ["UTM" ,"Z11"]
            position "3865000 595200 200000"
            orientation 1 0 0 -1.57
            description "Theater View 2"
            navType   ["EXAMINE", "FLY"]
            },

GeoViewpoint {
            geoOrigin IS geoOrigin
            geoSystem ["UTM" ,"Z11"]
            position "3935000 595200 500000"
            orientation 1 0 0 -1.57
            description "High Ground"
            navType   ["EXAMINE", "FLY"]
            },

GeoViewpoint {
            geoOrigin IS geoOrigin
            geoSystem ["UTM" ,"Z11"]
            position "3865500 578200 10000000"
            orientation 1 0 0  -1.57
            description "Welcome to Ft.Irwin"
            navType   ["EXAMINE", "FLY"]
            },

GeoViewpoint {
            geoOrigin IS geoOrigin
            geoSystem ["UTM" ,"Z11"]
            position "38815000 595200 80000"
            orientation 1 0 0 -1.57
            description "Northern Tatical GeoViewpoint"
            navType   ["EXAMINE", "FLY"]
            },
```

```
GeoViewpoint {
             geoOrigin IS geoOrigin
             geoSystem ["UTM" ,"Z11"]
             position "3885000 595200 80000"
             orientation 1 0 0 -1.57
             description "Southern Tatical GeoViewpoint"
             navType   ["EXAMINE", "FLY"]
             },


GeoViewpoint {
             geoOrigin IS geoOrigin
             geoSystem ["UTM" ,"Z11"]
             position "3940000 695200 15000"
             orientation 0 1 0 1.57
             description "Looking West"
             navType   ["EXAMINE", "FLY"]
             },

GeoViewpoint {
             geoOrigin IS geoOrigin
             geoSystem ["UTM" ,"Z11"]
             position "3860000 700000 2000"
             orientation 0 1 0 1.11
             description "Oblique View "
             navType   ["EXAMINE", "FLY"]
             },


GeoViewpoint {
             geoOrigin IS geoOrigin
             geoSystem ["UTM" ,"Z11"]
             position "4010000 587500 40000"
             orientation 0 1 0 3.141592
             description "Looking south "
             navType   ["EXAMINE", "FLY"]
             },

GeoViewpoint {
             geoOrigin IS geoOrigin
             geoSystem ["UTM" ,"Z11"]
             position "3896000 530900 12000"
             orientation 0 1 0 +3.201592
             description "Uh oh "
             navType   ["EXAMINE", "FLY"]
             },

GeoViewpoint {
             geoOrigin IS geoOrigin
             geoSystem ["UTM" ,"Z11"]
             position "3715000 595200 20000"
             orientation 1 0  0  -.3
             description "Looking North"
             navType   ["EXAMINE", "FLY"]
             },



Shape {
```

```
        appearance Appearance {
          material Material { diffuseColor 0.8 1.0 0.3 }

texture ImageTexture { #   DEF _TXT0
 url   ["Terrain\FortIrwinTerrainTexture.jpg" "FortIrwinTerrainTexture.jpg"]
}
}
    geometry GeoElevationGrid {
         geoOrigin  IS geoOrigin
         geoSystem [ "UTM", "Z11" ]
         geoGridOrigin "3860000 519000 0"
        xDimension  10
        zDimension  11
        xSpacing     "17600"
        zSpacing     "17000"
        solid        FALSE
        creaseAngle 0.785
       height [
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
               ]


    }
}

# this is a test to see what the terrain looks like in the current vrml world
# The Terrain is not to scale but has a good look
GeoLocation {
        geoOrigin IS geoOrigin
      geoSystem ["UTM","Z11"]
             geoCoords "3985500 673200 0" # ft irwin 2

      children [
         Transform {
#         rotation 1 0 0 3.1415926
           children [

             Elevation {}

          ]
         }
```

```
]
}

#GeoLocation {
#       geoSystem [ "GDC" ]
#       geoCoords "36.601388 -121.88166 200000" # Monterey CA
#       children [
#          Transform {
#         rotation 1 0 0 3.1415926
#           children [
#             Shape {
#              appearance Appearance { material Material { diffuseColor 1 0 0
}}
#            geometry Cone { bottomRadius 100000 height 500000 }
#           }
#         ]
#          }
#]
#}

#***Add Proximity sensor to remove cone****



GeoLocation {
        geoOrigin IS geoOrigin
       geoSystem ["UTM","Z11"]
              geoCoords "3905500 578200 2000000" # ft irwin 2

      children [


LOD {
       range [ 2500000 ]

       level [
Group{ children [
             Shape {
              appearance Appearance { material Material { diffuseColor 1 1 1 }}
             geometry Sphere { radius 0.000001 }
            }]},

Group { children [
Billboard {

              axisOfRotation 0 0 0
       children [
         Transform {
          translation 10000 0 0
          rotation 1 0 0 0
           children [
            Shape {
              appearance Appearance {
                    material Material { diffuseColor 1 1 1 }
                                   }
                     geometry DEF City_Name Text {
                                  string ["  Operation XML", "  Ft Irwin, CA "]
                                  fontStyle FontStyle { size 700000.0 }
                                                 }
             }
```

```
          ]
        }
]
}
        Transform {
         rotation 1 0 0 3.1415926
           children [
              Shape {
               appearance Appearance { material Material { diffuseColor 1 1 1 }}
              geometry Cone { bottomRadius 100000 height 500000 }
             }
          ]
        }]}
      ] }
]
}


#**** The Globe is defined Modified from the Geo Touch sensor Demo code by
Martin Reddy.

    Shape {
       appearance Appearance {
         material Material { diffuseColor 0.8 1.0 0.3 }

       texture DEF TEX ImageTexture { url ["Terrain\earth2.gif" "earth2.gif"] }
             }
       geometry GeoElevationGrid {
       geoOrigin IS geoOrigin
         geoSystem [ "GDC" ]
         geoGridOrigin "-90 -180 0"
         xDimension 21
         zDimension 21
         xSpacing "18"
         zSpacing "9"
         height [
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
                0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
               ]
       }
    }
```

```
]
}
}# End Terrain

Terrain {}
```

APPENDIX AB. TARGET PROTO

```
#VRML V2.0 utf8
#This is the Aircraft PROTO. This proto is used to display a
#3D rendering of an Air Attack Plan.  The attack plan is developed
#using XML.  The XML is tranlated to VRML/X3D and rendered.
#
#This PROTO uses GeoVRML 1.0 to move and locate objects
#The Aircraft PROTO also access several EXTERNPROTOS that
#provide functionality such as a Heads up Display
#This PROTO is called from The Air Attack Plan World
#The purpose of the PROTO is to give the main world modularity
#The Target PROTO allows  The Air Attack Plan to select targets and
#geo locate them to on the Air Plan.
#The Aircraft PROTO animates the chosen object through the main world
#and displays pertinate information when the object is selected.#
#Author: Jason Quigley
#Date: 25 March 2000
#Revised: 10 June 2000

#Future Updates:
#

WorldInfo {
info [ "This is a PROTO for a 3-D Air Attack Plan Autogenerated by XSL",
       " from and XML Air Attack Plan"
       "This world was Developed by Mark Murray and Jason Quigley",]

title "Target PROTO"
}

#The first set of Declarations allow the proto to access a library of
#Target models.  The model PROTO provide the various levels of detail from
#high quality to track symbology

# A new EXTERNPROTO declaration is needed for every Target type
# to be displayed in the world


EXTERNPROTO SAM_Site [ ] ["Target\Target_lib.wrl#SAM_Site"
"Target_lib.wrl#SAM_Site"]

EXTERNPROTO Early_Warning_Radar [ ]
["Target\Target_lib.wrl#Early_Warning_Radar"
"Target_lib.wrl#Early_Warning_Radar"]


#The next set of EXTERNPROTO declarations provides access to GeoVRML
#GeoVRML is used to locate and animate the models through geographic
#references.

# NOTE: make sure the path name to protos is correct
# original proto was sent with GeoVRML PROTO in a sub folder


EXTERNPROTO geoOrigin [
                    exposedField MFString     geoSystem
                    exposedField SFString     geoCoords
                    field        SFBool   rotateYUp     ]
                    [ "GeoVRML\geoOrigin.wrl"
```

```
                    "\..\GeoVRML\geoOrigin.wrl"]

EXTERNPROTO GeoLocation [
                    field SFNode   geoOrigin
                    field MFString geoSystem
                    field SFString geoCoords
                    field MFNode   children
                    eventIn  SFString set_geoCoords
                    eventOut SFString geoCoords_changed ]
                    ["GeoVRML\GeoLocation.wrl"
                     "\..\GeoVRML\GeoLocation.wrl"]

EXTERNPROTO GeoTouchSensor [
                    exposedField SFBool   enabled              # TRUE
                    field        SFNode   geoOrigin            # NULL
                    field        MFString geoSystem            # [ "GDC" ]
                    eventOut     SFVec3f  hitNormal_changed
                    eventOut     SFVec3f  hitPoint_changed
                    eventOut     SFVec2f  hitTexCoord_changed
                    eventOut     SFBool   isActive
                    eventOut     SFBool   isOver
                    eventOut     SFTime   touchTime
                    eventOut     SFString hitGeoCoord_changed]
                    ["GeoVRML\GeoTouchSensor.wrl"
                     "\..\GeoVRML\GeoTouchSensor.wrl" ]


#This is the Main PROTO if the Target_PROTO
#Inside this PROTO the Models are called and Geolocated
#Infomation about the model is diplayed

PROTO Target [

             field        SFNode     geoOrigin  NULL
             field        MFString   geoSystem  ["UTM"]
             field        MFNode    TargetType [ ]
             field        SFString   CallSign "NoSign"
             field        SFString   TargetPosition ""
            ]

{#--BEGIN Target PROTO

# The Target is called and Geolocated to TargetPosition
# The Transform node is there for future improvements

Group {

  children [


    DEF GeoPos  GeoLocation {
               geoOrigin IS geoOrigin
               geoSystem IS geoSystem
               geoCoords IS TargetPosition
               children IS TargetType

               } #--GeoPos


          ] #--children main

     } #--Group main
```

```
}#--END Target PROTO

#~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
# Instantiation of Target PROTO for Test and Debug
#~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Background {
    skyColor [
        0.0 0.2 0.7,
        0.0 0.5 1.0,
        1.0 1.0 1.0
    ]
    skyAngle [ 1.309, 1.571 ]
    groundColor [
        0.1 0.10 0.0,
        0.4 0.25 0.2,
        0.6 0.60 0.6,
    ]
    groundAngle [ 1.309, 1.571 ]
}

      Target {
#             geoOrigin USE AirPlan_Origin
              geoSystem ["UTM", "Z11"]
              TargetType [Early_Warning_Radar{} ]
              #TargetPosition "3928800 511300 0"
              TargetPosition  "3933500 536500 0"
              }
```

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APPENDIX AC. TARGET LIBRARY

```
#VRML V2.0 utf8 CosmoWorlds V1.0
#This PROTO is Used in the Virtual Air Attack Plan
#The Targets are simple antne
#The world was modified by Jason Quigley to be used in the Virtual Air Attack
Plan
# currently the modeled is scaled up but this may be a problem with actual
Terrain Data
#if scale is changed make sure to change Geoviewpoints and viewpoints in
Aircraft_PROTO
#
#Modified by Jason Quigley
#
PROTO Early_Warning_Radar []

{#-Begin Early_Warning_Radar



Group {

children [


                Viewpoint {
                        description "Above Target"
#                       description IS Top_Description
                        position 500.0 20000.0 0.0
                        orientation 1.0 0.0 0.0 -1.57           },
                   NavigationInfo {

                        type ["FLY" "EXAMINE"]
},


                        Viewpoint {
                        description "Directly OverHead"
                        position 15.0 9000.0 0.0
                        orientation 1.0 0.0 0.0 -1.57           },




Transform {
        translation 0 .25 0
        scale  1000 1000 1000
#       rotation 0.0 0.0 1.0  1.57
        children [
Shape {
    appearance Appearance {
        material Material {
            diffuseColor 1 0 0
        }
    }
    geometry Extrusion {
        crossSection [
            -1.0  1.0,   1.0  1.0,
             1.0 -1.0,  -1.0 -1.0,
```

```
            -1.0  1.0
        ]
        spine [ 0.0 0.0 0.0,  0.0 1.0 0.0 ]

      scale [ 1.0 1.0,      0.6 0.6 ]
    }


}
]
}

Transform {
      scale  20000.0 20000.0 20000.0
      translation 0 .5 1
      rotation 1.0 0.0 0.0  0
      children [
      Shape {
    appearance Appearance {
        material Material {

            diffuseColor 1 0 0
            transparency .3
#          emissiveColor
#          ambientIntensity  0.5
#            specularColor 0 0 1
        }
    }
    geometry Extrusion {
        creaseAngle 0.785
        crossSection [
             1.00  0.00,   0.92 -0.38,
             0.71 -0.71,   0.38 -0.92,
             0.00 -1.00,  -0.38 -0.92,
            -0.71 -0.71,  -0.92 -0.38,
            -1.00 -0.00,  -0.92  0.38,
            -0.71  0.71,  -0.38  0.92,
             0.00  1.00,   0.38  0.92,
             0.71  0.71,   0.92  0.38,
             1.00  0.00
        ]
        spine [ 0.0 0.0 0.0,
      0 0.1 0
      0 0.2 0
      0 0.3 0
      0 0.4 0
      0 0.5 0
      0 0.6 0
      0 0.7 0
      0 0.8 0
      0 0.9 0
      0 1 0 ]


      scale [ 1.0 1.0
0.994987437  0.994987437
0.979795897  0.979795897
0.953939201  0.953939201
0.916515139  0.916515139
0.866025404  0.866025404
0.8   0.8
0.714142843  0.714142843
```

```
0.6    0.6
0.435889894   0.435889894
0      0
]
      }
}
]
}
]
}
}# End Early Warning Radar

PROTO SAM_Site []

{#-Begin Sam_Site


Group {

children [

Transform {
        translation 0 .25 0
#       scale  4.0 0.5 2.0
#       rotation 0.0 0.0 1.0  1.57
        children [
        Shape {
                appearance Appearance {
                        material Material {
                        diffuseColor 0.0 0.0 1.0
                                        }

                                        }
                geometry Box {
                size 2.0 .5 1.5
        }
}
]
}
Transform {
#       scale  4.0 0.5 2.0
        translation 0 .5 1
        rotation 1.0 0.0 0.0  -2.00
        children [
        Shape {
                appearance Appearance {
                        material Material {
                        diffuseColor 0.0 0.0 1.0
                                        }

                                        }
                geometry Cone {
                bottomRadius 1.0
                height .25
        }
}
]
}
]
}
}
```

```
#DeBug and Display instantiation of PROTO

Background {

    skyColor [
        0.0 0.2 0.7,
        0.0 0.5 1.0,
        1.0 1.0 1.0
    ]
}

#SAM_Site {}
Early_Warning_Radar {}
```

APPENDIX AD. AIRCRAFT PROTO

```
#VRML V2.0 utf8
#This is the Aircraft PROTO. This proto is used to display a
#3D rendering of an Air Attack Plan.  The attack plan is developed
#using XML.  The XML is tranlated to VRML/X3D and rendered.
#
#This PROTO uses GeoVRML 1.0 to move and locate objects
#The Aircraft PROTO also access several EXTERNPROTOS that
#provide functionality such as a Heads up Display
#This PROTO is called from The Air Attack Plan World
#The purpose of the PROTO is to give the main world modularity
#The Aircraft PROTO allows  The Air Attack Plan to select aircraft and
#give them attributes such as Call Sign, Mission, Take off Position.
#The Aircraft PROTO animates the chosen object through the main world
#and displays pertinate information when the object is selected.
#

#Author: Jason Quigley
#Date: 25 March 2000
#Revised: 10 June 2000

#added 5 June Master Clock from main world

#Future Updates:
#
# Add additional models to PROTO library
# Add orientation interpolator to turn aircraft in direction of movement
# add orientation interpolatorto make aircraft bank into turns

WorldInfo {
info [ "This is a PROTO for a 3-D Air Attack Plan Autogenerated by XSL",
       "from and XML Air Attack Plan"
       "This world was Developed by Mark Murray and Jason Quigley",]

title "Aircraft PROTO"
}

#The first set of Declarations allow the proto to access a library of
#aircraft models.  The model PROTO provide the various levels of detail from
# high quality to track symbology

# A new EXTERNPROTO declaration is needed for every Aircraft type
# to be displayed in the world


EXTERNPROTO F-15 [
                    field SFString Top_Description
              ]
                    ["Aircraft\F-15\F-15_PROTO.wrl#F-15"
                     "F-15\F-15_PROTO.wrl#F-15"]

EXTERNPROTO APACHE [
                    field SFString Top_Description
                ]

                ["Aircraft\Ah-64\AH-64_PROTO.wrl#AH-64"
                 "Ah-64\AH-64_PROTO.wrl#AH-64"
                 "AH-64.wrl#AH-64"]
```

```
# EXTERNPROTO AH-64 [
#                    field SFString Top_Description ]
#
#                  ["Aircraft\Ah-64\AH-64_PROTO.wrl#AH-64"
#                   "Ah-64\AH-64_PROTO.wrl#AH-64"]
#Apace needs to be replaced with AH-64
#This was added beacause Apache is found in XML file

#The next set of EXTERNPROTO declarations provides access to GeoVRML
#GeoVRML is used to locate and animate the models through geographic
#references.

# NOTE: make sure the path name to protos is correct
# original proto was sent with GeoVRML PROTO in a sub folder

EXTERNPROTO geoOrigin [
                    exposedField MFString     geoSystem
                    exposedField SFString     geoCoords
                    field        SFBool    rotateYUp    ]
                    [ "GeoVRML\geoOrigin.wrl"
                      "\..\GeoVRML\geoOrigin.wrl"]

EXTERNPROTO GeoLocation [
                    field SFNode   geoOrigin
                    field MFString geoSystem
                    field SFString geoCoords
                    field MFNode   children
                    eventIn  SFString set_geoCoords
                    eventOut SFString geoCoords_changed ]
                    ["GeoVRML\GeoLocation.wrl"
                     "\..\GeoVRML\GeoLocation.wrl"]

EXTERNPROTO GeoPositionInterpolator [
                    field        SFNode   geoOrigin
                    field        MFString geoSystem
                    field        MFFloat  key
                    field        MFString keyValue
                    eventIn      SFFloat  set_fraction
                    eventOut     SFVec3f  value_changed
                    eventOut     SFString geovalue_changed ]
                    ["GeoVRML\GeoPositionInterpolator.wrl"
                     "\..\GeoVRML\GeoPositionInterpolator.wrl"]

EXTERNPROTO GeoTouchSensor [
                    exposedField SFBool   enabled             # TRUE
                    field        SFNode    geoOrigin           # NULL
                    field        MFString  geoSystem           # [ "GDC" ]
                    eventOut     SFVec3f   hitNormal_changed
                    eventOut     SFVec3f   hitPoint_changed
                    eventOut     SFVec2f   hitTexCoord_changed
                    eventOut     SFBool    isActive
                    eventOut     SFBool    isOver
                    eventOut     SFTime    touchTime
                    eventOut     SFString  hitGeoCoord_changed]
                    ["GeoVRML\GeoTouchSensor.wrl"
                     "\..\GeoVRML\GeoTouchSensor.wrl" ]

#--The specific PROTOs needed to actuated behaviors in the Aircraft PROTO are
refernced
#  for use.
```

```
#--The HeadsUpDisplay is used by the AircraftPROTO to Display information about
each
#  aircraft onto the screen.

EXTERNPROTO HeadsUpDisplay [

#                    field        SFNode     geoOrigin
#                    field        MFString   geoSystem
                     field        SFString   CallSign
                     field        SFString   Mission
                     field        SFString   MissionNumber
                     field        SFString   TakeoffPosition
#                    field        MFString   WayPoints
                     field        SFString   AircraftName
                     eventIn            SFString   set_geoCoords
                     eventIn            SFBool   turnOn
                     ]

      ["Aircraft\Features\HeadsUpDisplay_PROTO.wrl#HeadsUpDisplay"
                    "Features\HeadsUpDisplay_PROTO.wrl#HeadsUpDisplay"]


#This is the Main PROTO if the AircraftPROTO
#Inside this PROTO the Models are called and Geolocated
#The Model is animated by GeoPostionInterpolator through Geolocation
#Infomation about the aircraft is diplayed on HUD


PROTO Aircraft [

      field       SFNode     geoOrigin  NULL
      field       MFString   geoSystem  ["UTM"]
      field       MFNode    AircraftType [ ]
      field       SFString   AircraftName "AC_PROTO"
      field       SFString   CallSign "NoSign"
      field       SFString   Mission "NoMission"
      field       SFString   MissionNumber "NoNumber"
      field       SFString   TakeoffPosition ""
      field       MFString   WayPoints [ "" ]
      field       MFFloat    WayPointTime [ ]
      eventIn           SFFloat         set_fraction
           ]
{  # BEGIN Aircraft PROTO

# The Aircraft is called and Geolocated to TakeoffPosition
# The Transform node is used here for future improvements(i.e. rolls, banks...)

Group {
  children [

#      DEF GeoTouch GeoTouchSensor {
#                   geoOrigin IS geoOrigin
#                   geoSystem IS geoSystem
#
#                   } #--GeoTouch
#
      DEF GeoTouch TouchSensor {}
      DEF GeoPos  GeoLocation {
                   geoOrigin IS geoOrigin
                   geoSystem IS geoSystem
                   geoCoords IS TakeoffPosition
```

```
                children [
                DEF Orient Transform {
                      rotation 0 1 0 3.141592
                      children [
                DEF Fly Transform {
                           children IS AircraftType
                        }
                       ]
                      }
                      ]

                } #--GeoPos


    DEF GeoPosInt GeoPositionInterpolator {

                geoOrigin IS geoOrigin
                geoSystem IS geoSystem
                key      IS WayPointTime
                keyValue  IS WayPoints
                set_fraction IS set_fraction

                }  #--GeoPosInt

    DEF RotateForward OrientationInterpolator {
                      set_fraction IS set_fraction

                      key [ 0.0, 0.2, 0.4, .6, .8, 1.0 ]
                      keyValue [
                               0 1 0 1
                               0 1 0 2
                               0 1 0 3
                               0 1 0 2
                               0 1 0 1
                               0 1 0 3

                                   ]

                } #--RotateForward

    DEF HUD  HeadsUpDisplay {

                AircraftName IS AircraftName
                CallSign IS CallSign
                Mission  IS Mission
                MissionNumber IS MissionNumber
                TakeoffPosition IS TakeoffPosition

                      }#--HUD

        ] #--children main

   } #--Group main

#  The Following javascript is used to face the aircraft into the direction of
Movement
#  The script call the initialized function to perform all activity first
#  The first for loop gets the string coordinates from the waypoints
#  and converts them to floats.  These floats are used to calculate the angle
corrected
# arctangent(ATAN2)  This angle is used as the course direction.
```

```
#  In order to keep the aircraft pointing straight the course must be place in
the
#  key value field twice. (Thus the orienation interpolator only interpolates
over the same
#  angle.
#  The second for loop is used to "double" up the key value times so that the
interpolation is done
#  in individual steps and the aircraft stays on the same course over each
interval


DEF  Fly_Forward Script {
             field        SFFloat              y1            1
             field        SFFloat              y2            1
             field        SFFloat              x1            1
             field        SFFloat              x2            1
             field        SFRotation     Temp_SFRotate 0 1 0 1.57
             field        MFRotation     Temp_MFRotate [ ]
             field        MFFloat              Temp_key      [ ]
             field        SFFloat              Angle         1.57
             field        SFInt32        i            0
             field        MFString       Coords IS  WayPoints
             field        MFFloat              Old_key IS WayPointTime
             field        MFRotation     New_keyvalue [ ]
             field        MFFloat        New_key   [ ]
             eventOut     MFRotation     keyvalue_changed
             eventOut     MFFloat        key_changed
             url "javascript:

             function initialize( ) {
                     for (i=0;i<Coords.length-1; i++)
                    {
                          Temp_MFF= Coords[i].split(' ',3);
                          y1=Temp_MFF[0];
                          x1=Temp_MFF[1];
                          Temp_MFF= Coords[i+1].split(' ',3);
                          y2=Temp_MFF[0];
                          x2=Temp_MFF[1];
                          Angle = Math.atan2(y2-y1,x2-x1);
      // Next section seems awkward but is only way it seems to work
                          Temp_SFRotate[0]= 0;
                          Temp_SFRotate[1]=  1;
                          Temp_SFRotate[2]= 0;
                          Temp_SFRotate[3]= Angle;
                          Temp_MFRotate[2*i]=Temp_SFRotate;
                          Temp_MFRotate[(2*i)+1]=Temp_SFRotate
                    };

                    keyvalue_changed = Temp_MFRotate;

                    Temp_key[0]=Old_key[0]
                    for (i=1;i<Old_key.length-1; i++)
                    {
                          Temp_key[(2*i)-1]=Old_key[i];
                          Temp_key[(2*i)]=Old_key[i]
                    };
                    Temp_key[(2*(Old_key.length-1))-1]=Old_key[Old_key.length-
1];
                    key_changed=Temp_key;
```

```
                    }"
               },

#

#- ROUTES

# The route nodes run the touch sensor to turn on the HUD
# The current position in the GeoLocation node is sent to the HUD
# The GeoPosition Interpolators data is sent to the Geolocation node
# Fly_Forward Points aircraft into correct Position

ROUTE  GeoTouch.isOver  TO   HUD.turnOn
ROUTE GeoPos.geoCoords_changed  TO HUD.set_geoCoords
ROUTE GeoPosInt.geovalue_changed TO GeoPos.set_geoCoords

ROUTE Fly_Forward.key_changed TO RotateForward.set_key
ROUTE Fly_Forward.keyvalue_changed TO RotateForward.set_keyValue
ROUTE RotateForward.value_changed TO Fly.set_rotation

}  # END Aircraft PROTO

#~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
#This section is used to Test and Debug Aircraft PROTO
#This will also display something if someone tries to open the PROTO
#~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Group {
children[

# Test Clock
    DEF Clock_Local TimeSensor {
                  cycleInterval 15
                  loop TRUE
                 }

Aircraft {
#      geoOrigin USE AirPlan_Origin
       geoSystem ["UTM","Z11"]
       AircraftType [ F-15 {Top_Description "**GHOST RIDER**" }]
       AircraftName "F-15"
       CallSign "Ghost Rider"
       Mission "Total Destruction"
        MissionNumber "A0123Z9"
       TakeoffPosition "4040500 536500 0"
       WayPointTime [0.0 .2 .4 0.5 .75 .85 1.0]
       WayPoints ["4040500 536500 0"
                 "4030500 559000 10000"
                 "4018355 578200 20000"
                 "4003550 598200 20000"
                 "4003550 578200 20000"
                 "4010500 559000 10000"
                 "4040500 536500 0"]
       }
     ]#--chidlren Main
   }#--Group Main
```

APPENDIX AE. HEADS UP DISPLAY PROTO

```
#VRML V2.0 utf8
#This is the HeadsUpDisplay PROTO. This proto is used to display a
#3D rendering of an Air Attack Plan.  The attack plan is developed
#using XML.  The XML is tranlated to VRML/X3D and rendered.
#The HeadsUpDisplay PROTO provides a HeadsUPDispaly to get individual
#Aircraft Information
# Someof the javascript code was modifed from code found in GeoVRML
# examples written by Martin Reddy SRI International
#Author: Jason Quigley
#Date: 25 March 2000
#Revised: 30 May 2000

#Future Updates:
#
WorldInfo {
info [ "This is a PROTO for a 3-D Air Attack Plan Autogenerated by XSL",
       " from and XML Air Attack Plan"
       "This world was Developed by Mark Murray and Jason Quigley",]

title "HeadsUpDisplay PROTO"
}


#--This PROTO was pulled from the PROTO repository
#The purpose of the proto is to attach an object to a viewpoint
#and keep in a fixed position of view while the viewer moves about the
#world.

PROTO HeadsUpGeom [
                    eventOut     SFVec3f    position_changed
                    eventOut     SFRotation orientation_changed
                    exposedField SFVec3f    center             0 0 0
                    exposedField SFVec3f    size               1000000000
1000000000 1000000000
                    exposedField SFBool     enabled            TRUE
                    exposedField MFNode     children           []
               ]

{#--BEGIN HeadsUPGeom

      Collision {
             collide FALSE
             children [
                    DEF PS1 ProximitySensor {
                           center               IS center
                           size                 IS size
                           enabled              IS enabled
                           orientation_changed IS orientation_changed
                           position_changed    IS position_changed
                    }

                    DEF XFORM Transform {
                           children IS children
                    }
             ]
      }

      ROUTE PS1.position_changed TO PS1.set_center
```

```
        ROUTE PS1.position_changed TO XFORM.set_translation
        ROUTE PS1.orientation_changed TO XFORM.set_rotation

}#--END HeadsUpGeom


PROTO Toggle [

              eventIn           SFBool set_boolean
              eventOut      SFInt32 whichChoice
             ]
{ #Begin toggle

# Toggle provide the logic to turn the HeadsUpDisplay on and off


        DEF Switcheroo          Script {

                            eventOut SFInt32 whichChoice IS whichChoice
                            eventIn        SFBool  set_boolean IS set_boolean

                            url "javascript:

                            function set_boolean( bool, eventTime)
                            {
                              if (bool == false) { whichChoice= -1;}
                                else             {whichChoice = 0;}
                            }" #end function


               } #End script


} #End toggle


PROTO HeadsUpDisplay [
        field         SFString    AircraftName "HeadsUpDisplay NoName"   #
        field         SFString    CallSign "HeadsUpDisplay NoSign"
        field         SFString    Mission "HeadsUpDisplay NoMission"
        field         SFString    MissionNumber "HeadsUpDisplay NoNumber"
        field         SFString    TakeoffPosition ""
#       field         MFString    WayPoints [ "" ]
         eventIn             SFString    set_geoCoords
         eventIn             SFBool      turnOn

               ]


{ #--BEGIN HeadsUpDisplay

Group {
      children [

              DEF Switcher Switch {
              whichChoice -1
              choice [

                      Group {
                            children [
```

```
                          HeadsUpGeom {
                               children [
                                 Transform {
                                         translation -2000 600 -3000
                                                 children[
                                                  Shape {
                                                   appearance Appearance {
                                                     material Material {
                                                        diffuseColor  0 1 0
#                                                       transparency 1
#                                                       emissiveColor
#                                                       ambientIntensity  0.5
#                                                       specularColor 0 0 1
                                                                        }#--Material
                                                                        }#--
Appearance

                                                 geometry DEF Info_Display Text {
                                                        string  ["What Happened?",
"Not Again!!"]
                                                        fontStyle FontStyle {
                                                          family  "TYPEWRITER"
                                                          style   "BOLD"
                                                          justify "FIRST"
                                                          size    150
                                                          spacing 1.0

                                                                 }#--fontsytle
                                                              }#--Text
                                                          }#--Shape
                                                       ]#--T children
                                                    }#--Transform
                                                 ]#--Heads-children
                                             }#--HeadsupGeom
                              ]
                            }#--end group
                         ]#--end choice
                       }#--end switch
                ]#--END Mainchildren
        }#--END Main Group

DEF Toggler Toggle {set_boolean IS turnOn }


# The javascript is used to add labels and combine the strings into
# a MFSTring to be easily Displayed


DEF Info_labeler Script {
                field  SFString set_callsign IS CallSign
                field  SFString set_mission  IS Mission
                field  SFString set_missionNo IS MissionNumber
                field  SFString set_origin IS TakeoffPosition
                field  SFString set_AircraftName IS AircraftName
                eventIn   SFString set_value IS set_geoCoords
                eventOut  MFString value_changed
                url "javascript:

                 function initialize( ) {
```

```
                    value_changed = new MFString(    'Call Sign : ' +
set_callsign,
                                                       'Mission   : ' + set_mission,
                                                       'Mission # : ' + set_missionNo,
                                                       'Aircraft  : '   +
set_AircraftName,
                                                       'Origin    : ' + set_origin,
                                                        '***Current Position (UTM)***',
                                                       'Northing:    ' ,
                                                       'Easting :    ' ,
                                                       'Altitude:    ' );
                                                     }


             function formatDecimal(argvalue, addzero, decimaln) {

                    var numOfDecimal = (decimaln == null) ? 2 : decimaln;
                    var number = 1;
                    number = Math.pow(10, numOfDecimal);
                    argvalue = Math.round(parseFloat(argvalue) * number) /
number;
                    argvalue = '' + argvalue;

                    if (argvalue.indexOf('.') == 0)
                    argvalue = '0' + argvalue;

                    if (addzero == true) {
                          if (argvalue.indexOf('.') == -1)
                                argvalue = argvalue + '.';

                          while ((argvalue.indexOf('.') + 1) > (argvalue.length
- numOfDecimal))
                                argvalue = argvalue + '0';
                    }

                    return argvalue;
             }


             function set_value( value, ts ) {
                    var s = value.split(' ',3);
                    var s2 = s[2]*3.28;

                    value_changed[6] = ( 'Northing: ' +
formatDecimal(s[0],true,2));
                    value_changed[7] = ( 'Easting :  ' +
formatDecimal(s[1],true,2));
                    value_changed[8] = ( 'Altitude:   ' +
formatDecimal(s2,true,2)+ ' ft.' );
             }"
       }#--labeler

#~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
# ROUTES
# Implement the switching mechanism
# Send Formated data to be displayed
#~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

ROUTE  Toggler.whichChoice TO Switcher.set_whichChoice
ROUTE Info_labeler.value_changed TO Info_Display.string

} # HeadsUpDisplay
```

```
#~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
#DEBUG
#Instantiation of Heads up display
#Used to test and display world if proto world is viewed
#~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

HeadsUpDisplay{         CallSign "HeadsUpDisplay Test"
                        Mission  "TestMission"
                        MissionNumber "TestMissionNumber"
                        TakeoffPosition "TakeoffPosition"
                        AircraftName "AircraftName"
                        turnOn TRUE
}
```

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APPENDIX AF. F-15 PROTO

```
#VRML V2.0 utf8
#
# This PROTO is used to manage different models of varying detail of the F-15
#
# This PROTO is used with  the Virtual Air Plan PROTO Suite
# attached Viewpoints are also describes
# The first 3 protos are different levels of detail for an F_15
# the next proto is the 3 protos placed together in an LOD format
# The libraries use external protos to keep the format neat and
# manageable.
# The only field passed to the PROTO is Top_Description
# This is used to name the viewpoints
# Note all EXTERNPROTO Declarations are called relative to MAIN WORLD (VRML Air
Plan)


EXTERNPROTO F-15_High [ ] ["Aircraft\F-15\F-15_High.wrl#F-15_High",
                          "F-15\F-15_High.wrl#F-15_High",
                          "F-15_High.wrl#F-15_High"]

EXTERNPROTO F-15_Medium [ ] ["Aircraft\F-15\F-15_Medium.wrl#F-15_Medium",
                            "F-15\F-15_Medium.wrl#F-15_Medium",
                            "F-15_Medium.wrl#F-15_Medium" ]

EXTERNPROTO F-15_Low [ ] ["Aircraft\F-15\F-15_Low.wrl#F-15_Low",
                         "F-15\F-15_Low.wrl#F-15_Low",
                         "F-15_Low.wrl#F-15_Low"  ]



PROTO F-15 [
           field SFString Top_Description "F-15_PROTO"
          ]


{ #Begin F-15

Group {
  children [


            Viewpoint {
                   description IS Top_Description
                   position 500.0 50000.0 0.0
                   orientation 1.0 0.0 0.0 -1.57
                   },

            Viewpoint {
                   description "Directly OverHead"
                   position 15.0 3000.0 0.0
                   orientation 1.0 0.0 0.0 -1.57
                   },
```

```
        Viewpoint {
              description "PORT Side"
              position 15.0 0.0 3000.0
              }


        Viewpoint { description "Ride On Back"
                  position 4200 1500 0
                  orientation -0.10 0.99 0.10 1.58 }

  Transform {
      children [

              LOD {
                    range [ 10000,100000]

                    level [
                          F-15_High {} ,
                          F-15_Medium  {} ,
                          F-15_Low {}
                                            ]
                  }# End LOD
           ]

         }#--End Transform

    ]#--End children Main
  }#--Group Main

}# END F-15

# Below and example of the PROTO is instantiated to test and Debug RPOTO

F-15 {}
```

APPENDIX AG. F-15 LOW RESOLUTION PROTO

```
#VRML V2.0 utf8
#This is a simple squished cone used as Track symbology for the Virtual Air
Attack Plan
#Author: Jason Quigley

PROTO F-15_Low [] {

Group{
 children[
# An Invisible sphere is placed around the cone to make it easier to touch with
the pointer
# as it flies around.


       Shape {

    appearance Appearance {
        material Material {

#            diffuseColor  0 0
            transparency 1
#          emissiveColor
#          ambientIntensity  0.5
#           specularColor 0 0 1
                    }
               }
    geometry Sphere {radius 15000}
         }

Transform {
       scale  0.5 2.5 1.5
       rotation 0.0 0.0 1.0  1.57
       children [


       Shape {
              appearance Appearance {
                     material Material {
                     diffuseColor 0.0 0.0 1.0
                                  }

                                  }
              geometry Cone {
              bottomRadius 3500.0
              height 6000.0
       }
}


]
}
]
}
}
```

```
Group {

  children[
              Viewpoint {
                     description "Far Away"
                     position 500.0 0.0 15000.0
              }

F-15_Low {}

]
}
```

APPENDIX AH. AH-64 APACHE PROTO

```
#VRML V2.0 utf8
#
# This is a library file of PROTOS describing an AH-64
#and an Attached Billboard
#This library is created with the help of images
#produced by users or RCAD
# File produced with RcCad V 1.4.7
# I thought the names were attached in the file but they were not
# I will credit the names once I go back on-line and match
# names with worlds
# The first 3 protos are different levels of detail for an F_15
# the next proto is the 3 protos placed together in an LOD format
# attached to a billboard of information
#  The libraries use external proto to keep the format neat and
# manageable.



EXTERNPROTO AH-64_High [ ]["Aircraft\Ah-64\AH-64_High.wrl#AH-64_High",
                         "Ah-64\AH-64_High.wrl#AH-64_High",
                         "AH-64_High.wrl#AH-64_High"
                        ]

#
#EXTERNPROTO AH-64_Medium [ ]["Aircraft\Ah-64\AH-64_Medium.wrl#AH-64_Medium",
#                            "Ah-64\AH-64_Medium.wrl#AH-64_Medium",
#                            "AH-64_Medium.wrl#AH-64_Medium"
#                               ]
#

EXTERNPROTO AH-64_Low [ ]["Aircraft\Ah-64\AH-64_Low.wrl#AH-64_Low",
                         "Ah-64\AH-64_Low.wrl#AH-64_Low",
                         "Ah-64_Low.wrl#AH-64_Low"
                        ]

PROTO AH-64 [
            field SFString Top_Description "*****A-64_PROTO*****"
            ]

{#--Begin AH-64

Group {
  children [


             Viewpoint {
                    description IS Top_Description
                    position 500.0 10000.0 0.0
                    orientation 1.0 0.0 0.0 -1.57          },
```

```
          Viewpoint {
                description "Directly OverHead"
                position 15.0 4000.0 0.0
                orientation 1.0 0.0 0.0 -1.57           },


          Viewpoint {
                description "PORT Side"
                position 15.0 0.0 5000.0
                                                   },


          Viewpoint { description "Ride On Back"
                    position 2300 1000 0
                    orientation -0.07 0.99 0.07 1.58 },

          Viewpoint { description "Ride Above"
                    position 2500 2300 0
                    orientation -0.30 0.91 0.30 1.67    },

      Transform {
           children [

                LOD {
                     range [ 120000]
                     level [

                     AH-64_High {} ,
#                    AH-64_Medium  {} ,
                     AH-64_Low {}

                          ]

                  }# End LOD
              ]

            }#--Transform

      ]#--children Main

   }#--Group Main

}# END AH-64


#~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
#Instantiation of AH-64 used to Test and Debug
#~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Background {

    skyColor [
        0.0 0.2 0.7,
        0.0 0.5 1.0,
        1.0 1.0 1.0
    ]
}

AH-64 {}
```

APPENDIX AI. AH-64 APACHE LOW RESOLUTION PROTO

```
#VRML V2.0 utf8
#
#--this proto produces the track sumbology for apache AH-64


PROTO AH-64_Low [] {
Group {
children [

# An Invisible sphere is placed around the cone to make it easier to touch with
the pointer
# as it flies around.

       Shape {

    appearance Appearance {
        material Material {

#            diffuseColor  0 0
            transparency 1
#          emissiveColor
#          ambientIntensity  0.5
#   .       specularColor 0 0 1
                  }
              }
    geometry Sphere {radius 15000}
         }


#--- Begin track Symbology

Transform {
       scale  4.0 0.5 2.0
#      rotation 0.0 0.0 1.0  1.57
       children [
       Shape {
              appearance Appearance {
                     material Material {
                     diffuseColor 0.0 0.0 1.0
                                 }

                                 }
              geometry Sphere {
              radius 2000
       }
}
]
}

]
}
}


AH-64_Low {}
```

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LIST OF REFERENCES

Ames, A.L., Nadeau D.R, and Moreland J.L., *VRML 2.0 Source Book,* Second Edition, John Wiley & Sons, Inc., 1997.

Brutzman, D.P., *"The Virtual Reality Modeling Language and Java",* Communications of the ACM, vol. 41 no. 6, June 1998, pp. 57-64.

Brutzman, D.P., *A Virtual World for an Autonomous Underwater Vehicle,* Ph.D. Dissertation, Naval Postgraduate School, Monterey, California, June 1996.

Chairman Joint Chiefs of Staff Instruction 6241.01, "Training Responsibilities for the US Message Text Formatting Program", 15 July 1994.

Goldfarb, C. F. and Prescod, P., *The XML Handbook*, Second Edition, Prentice Hall PTR, 2000.

Hall, M. J. and Schneider, J. C., "XML-MTF, A Technology Opportunity to Position MTFs for the 21st Century," [http://spider.osfl.disa.mil/dii/aog_twg/twg/ssdmd/USMTF-XML.ppt], 20 Aug 99.

Harold, Rusty E., "Intro to XML", [http://metalab.unc.edu/xml/slides/xephon/introxml/], February 2000.

Harold, Rusty E., *XML Bible*, IDG Books Worldwide, Inc., 1999.

Hopkins, Brian, "XML Development: First Things First," Navy Center for Tactical Systems Interoperability, December 1999.

Joint Publication 3-52, "Doctrine for Joint Airspace Control in the Combat Zone", 22 July 1995.

Joint Publication 3-56.1, "Command and Control for Joint Air Operations," 14 November 1994.

Kay, Michael, *Instant Saxon*, [http://users.iclway.co.uk/mhkay/saxon/instant.html], 2000.

Kay, Michael, *XSLT Programmer's Reference*, Wrox Press Ltd., 2000.

Khare, R. and Rifkin, A., "XML: A Door to Automated Web Applications", *IEEE Internet Computing*, July/Aug 1999.

Reddy M, "GeoVRML 1.0 Recommend Practice"[http://www.geovrml.com]. May 2000.

United States Geological Survey, Department of the Interior, "213 km NE of Los Angeles, California, United States," [http://terraserver.microsoft.com/image.asp?S=16&T=2&X=40&Y=305&Z= 11&W=2], July 1969.

XML-MTF Development Team, *XML-MTF Mapping, Second Public Working Draft*, 13 March 2000.

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